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PHILIPPINE ISLANDS
BUREAU OF PUBLIC WORKS - QUARTERLY BULLETIN

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BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND POLICE · PHILIPPINE ISLANDS

Quarterly Bulletin

. 6 APRIL 1, 1917 No. 1

Palico bridge, Province of Batangas. Road and bridge constructed in 1916.

QUARTERLY BULLETIN

BUREAU OF PUBLIC WORKS
MANILA, P. I.

ISSUED QUARTERLY UNDER THE DIRECTION OF
THE DIRECTOR OF PUBLIC WORKS

L. S. BOGGESS, COMPILER

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ANNUAL REPORT FOR THE BUREAU OF PUBLIC WORKS TO THE SECRETARY OF COMMERCE AND COMMUNICATIONS FOR THE YEAR ENDING DECEMBER 31, 1916.

AN ACKNOWLEDGMENT.

In devoting this issue of the Quarterly Bulletin to the publication of the Annual Report for the year ending December 31, 1916, publicity is given in concrete form to information which the Director believes will prove of special interest to the three thousand readers now on its mailing list.

It may be appropriate to explain that all costs entering into the operation of the Bureau, including administration and engineering salaries, traveling expenses, supplies, the preparation of plans, surveys and investigations are allocated through the assessment of a uniform surcharge on the prime cost of work. The surcharge for 1916 was 9 per cent. Project appropriations consequently reimburse the Insular Treasury in the full amount of the entire Bureau operating expense, exclusive of an item of ₱377,227.27 which under existing law is credited as Insular aid to local governments. The fact that the Legislature very materially increased its appropriation for public works in 1917 over that of any previous year is cited as evidence that the general public is thoroughly satisfied with the results accomplished on public works in past years.

To the district engineer and his assistants credit in a large measure is due for the coöperative spirit displayed by Bureaus, provinces and municipalities in a concerted effort to build adequately and substantially. Without materially deviating from a systematically developed public works program, and through adhering strictly to recommendations for projects best serving the interests of the general public, they have won the respect and support of those officials directly responsible to the people for the distribution of public funds. The district engineer's duties are arduous and his individual responsibility as an engineer is great. His strict attention to duty and intense interest in every project, whether of small or great engineering magnitude, has ingratiated the bureau with the public.

The Director takes this opportunity to express his appreciation for the loyalty which each and every individual employee maintains toward the organization. As a result complete harmony has prevailed between the several divisions of the Bureau and amongst the employees within each division. Forming an integral part of the whole, the work of the Bureau would not have been complete except for the faithful and efficient services as rendered by each and every subordinate.

ORGANIZATION AND PERSONNEL.

The organization responsible for the execution of all public works has been perfected under a plan of central control, with decentralized administration. Engineering districts, as far as practicable, are coextensive with the territorial limits of the respective provinces. The district engineer, representing the Director of Public Works, is responsible for directing the work in accordance with plans either prepared by the central office, or prepared locally and approved by the Director of Public Works.

Provincial autonomy, however, is recognized in that projects are selected by the provincial board, and in recommending public works projects the district engineer deals directly with such board.

The officers and employees paid directly from the Bureau appropriation include 84 Americans and 193 Filipinos. The total is less than that of any previous year since the Bureau's reorganization in 1908.

The technical personnel now includes 42 Filipino engineers, 34 having qualified under civil-service examinations as follows:

16 civil engineers.
12 assistant civil engineers.
4 junior civil engineers.
1 surveyor.
1 junior surveyor.

It also includes 9 Filipino architects and architectural designers.

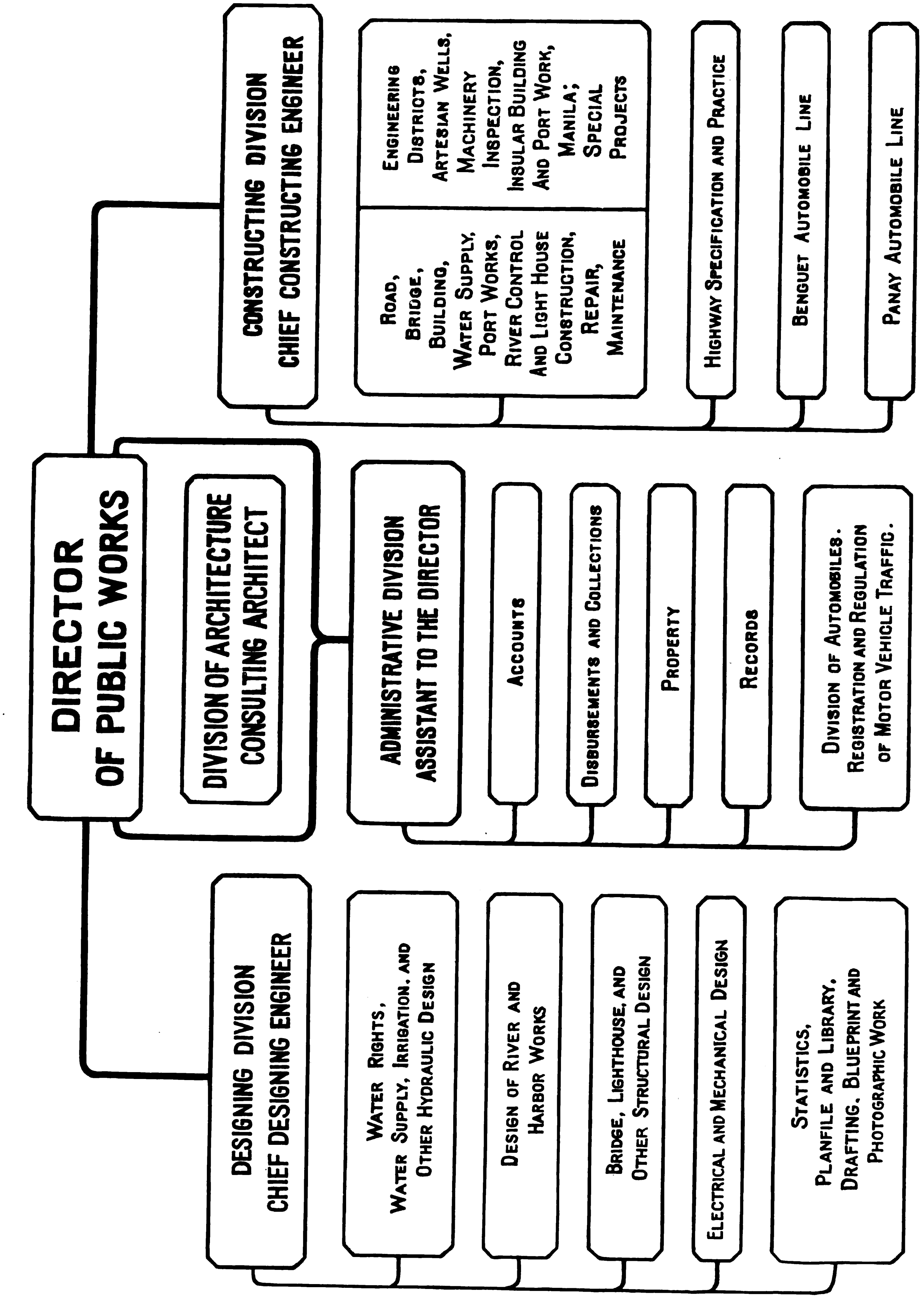
The public works administration in fifteen of the forty-two districts is being directed by Filipino district engineers. In making these assignments, those qualified under civil-service regulations and having had the most practical experience were selected. The results obtained have been gratifying. It should be stated, however, that in some cases the employee, because of lack of experience, was not prepared to accept the greater responsibility thus assumed. The necessity for such assignments developed through an unusual exodus of American engineers, with no eligibles on the local civil-service list for replacing them.

In view of the limited number of qualified Filipino engineers available, and that those in the service may receive the benefit of competent engineering supervision, it is recommended that the services of the American technical personnel now employed by the Philippine Government be contracted for a definite period of years.

To expeditiously and economically prosecute public works throughout the Islands, and that both design and construction be in keeping with the best engineering practices, it is essential that the Government have experienced engineers who are familiar with Philippine conditions. As a rule the nonresident engineer has not been content to accept service in the Philippines as a permanent assignment. Constantly changing engineers, especially in the district positions, has proven detrimental to the best interests of the Government, both in the greater cost of work and occasionally in an inadequate type of construction. This condition must prevail until engineers permanently residing in the Islands have secured the training and experience essential for the accomplishment of the best engineering results. It is encouraging to note that the graduating class of the Philippine University for 1917 included thirteen civil engineers. With a like number of engineering graduates for filling the needs of the service each year, conditions must necessarily improve and an efficient organization obtain in course of time without the embarrassment of a constantly changing engineering personnel.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1916.


DIRECTOR OF PUBLIC WORKS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
WATER RIGHTS, WATER SUPPLY, IRRIGATION, AND OTHER HYDRAULIC DESIGN
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE, AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS, PLANFILE AND LIBRARY, DRAFTING, BLUEPRINT AND PHOTOGRAPHIC WORK
DIVISION OF ARCHITECTURE CONSULTING ARCHITECT
ADMINISTRATIVE DIVISION ASSISTANT TO THE DIRECTOR
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS
DIVISION OF AUTOMOBILES. REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC.
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHT HOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORK, MANILA; SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE
PANAY AUTOMOBILE LINE

Expenditures supervised by the Bureau of Public Works.

Item.	Insular expenditures.		Provincial and municipal expenditures (Insular aid allotted, ₱1,624,050.13).	Funds from private sources.	Total.
	Bureau of Public Works.	Appropriations controlled by other Bureaus.			
Roads and bridges	₱89,532.13		₱5,831,074.82		₱5,920,606.95
Buildings	194,431.94	₱388,803.98	1,261,065.04		1,844,300.96
Maintenance, alteration and repair of public buildings	185,983.82	15,958.65			201,942.47
River and harbor work, lights, buoys and beacons	862,179.30	33,241.55	582.44	₱15,592.55	911,595.84
Artesian wells and water supply	166,599.02	461.46	469,311.22	5,655.50	642,027.20
Irrigation projects	25,424.99	353.45		430.86	26,209.30
Tres Cruces Dam		22,235.91			22,235.91
Operation of auto lines, quarries and the supervision of motor vehicle traffic	153,222.87				153,222.87
Miscellaneons	54.80	73,816.48	320,846.94	12,621.42	407,339.64
Total	1,677,428.87	534,871.48	[a]7,882,880.46	34,300.33	10,129,481.14

[a] This includes ₱93,639.43 of expenditures originally made by Bureau but subsequently collected from provinces.

Road effectively maintained, Sorsogon, Province of Sorsogon.

Balance sheet, Bureau of Public Works.

December 31, 1915.			December 31, 1916.		December 31, 1915.			December 31, 1916.	
		CURRENT ASSETS.					CURRENT LIABILITIES.		
₱33,022.47		Cash (collecting and disbursing officers)		₱52,265.27	₱479,640.02		Treasury overdraft		₱526,679.54
442,040.37		Supplies and materials		495,754.46	91,148.09		Accounts payable		94,007.89
1,299.76		Claims (pending adjustments)		285.71	149,067.02		Accrued leave payable		143,831.40
248,276.78		Accounts receivable		229,212.10	None		Deferred Credits to Income		3,383.47
400.00		Investment and securities		400.00			SURPLUS.		
		FIXED ASSETS.			5,184.25		Appropriated surplus (For purchase of equipment.)		10,015.24
754,894.51		Real property and Improvements		752,278.77					
	₱2,185,891.48	Equipment	₱2,100,806.10		1,905,431.66		Principal Account Surplus (Fixed assets.)		1,739,787.17
1,150,537.15	1,035,354.33	(Loss depreciation)	1,113,297.70	987,508.40					
2,630,471.04				2,517,704.71	2,630,471.04				2,517,704.71

Statement of appropriations, income, and expense January 1 to December 31, 1916.

DEBIT.

Reversion of unexpended balance operating appropriation	₱1,973,007.56	
Expenditures operating capital offset by receipts	2,026,992.44	₱4,000,000.00
Reversion of unexpended balance of administrative appropriation	23,079.86	
Expenditures administrative appropriation	833,784.14	
Outlay purchase equipment	10,169.01	
Balance of equipment appropriation brought forward to 1917	10,015.24	877,048.25
Reversion of receipts		2,501,075.49
Total		7,378,123.74

CREDIT.

Appropriation for operating capital Act 2540 (expenditures offset by income)		₱4,000,000.00
Appropriation for administrative expense of bureau of public works (expenditures partially offset by surcharges collected, Act 2540)	₱871,864.00	
Balance brought forward from fiscal year 1915 of equipment appropriation	5,184.25	877,048.25
Receipts—Prime cost of works	2,026,992.44	
Receipts—Surcharges	392,582.40	
Receipts from operation—Miscellaneous	30,900.89	
Gain on supplies sold	1,133.23	
Inventory adjustments	2,685.61	
Incidental receipts	845.88	
Income from rental	28,188.86	
Interest on investment and securities	40.00	
Sales of fixed assets	17,706.18	2,501,075.49
Total		7,378,123.74

Transaction affecting principal account surplus (fixed assets) during 1916.

Principal account surplus, December 31, 1915	₱1,905,431.66
Equipment purchase	10,169.01
Equipment acquired by transfer	105,311.95
Equipment found at station	501.78
Total	2,021,414.40

Equipment sold	₱58,692.82
Equipment condemned and dropped	32,198.40
Equipment dropped by transfer	112,631.77
Equipment transferred to supplies	160.87
Depreciation written off	77,943.37
Principal account surplus, December 31, 1916	1,739,787.17
Total	2,021,414.40

Operation statement, Bureau of Public Works.

DEBIT.

Operating revenue:	
Rentals	₱28,188.86
Surcharges	392,582.40
Gain on goods sold	1,133.23
Interest on investments and securities	40.00
Inventory adjustments	2,865.61
Other service income	31,746.77
Net loss for the year through aid to local governments	377,227.27
Total	833,784.14

CREDIT.

Operating expense:	
Supervising, technical and clerical service	₱639,964.91
Labor	36,445.54
Consumption of materials	50,430.87
Rental of buildings	13,500.00
Illumination and power service	8,603.14
Traveling expense of personnel	32,321.37
Repair service	26,463.14
Postal, telegraph, telephone and cable service	8,718.58
Other expense	17,336.59
Total	833,784.14

The larger results of the year's work.

Surfaced road constructed and designated first class	kilometers	368.5
Reinforced concrete bridges and culverts completed	number	200
Successful deep wells completed	do	122
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	number	84

Expenditures supervised during the year.

Total expenditures	₱10,129,481.14	
Total expended upon road and bridge work	5,920,606.95	[a] 1
Total expended upon building work	2,046,243.43	[b] 17
Total expended upon port works	911,595.84	[a] 12
Total expended upon water supply	642,027.20	[a] 1

[a] Per cent of increase over 1915 expenditures.

[b] Per cent of decrease from 1915 expenditures.

Expenditures on miscellaneous items account for the balance.

ROAD WORK.

Length of road in existence.

	December 31, 1916.	December 31, 1915.
	Kilometers.	*Kilometers.*
First class	3,439.6	3,067.7
Second class	2,045.8	2,082.2
Third class	3,440.7	3,051.7
Total	8,926.1	8,201.6

Relation of first-class road construction and maintenance.

Fiscal year ending—	Designated first-class road at end of year.	First-class road constructed during year.	Average maintained throughout the year by the caminero system.
December 31—	*Kilometers.*	*Kilometers.*	*Kilometers.*
1914	2,495.5	330.2	2,317.6
1915	3,064.0	499.5	2,732.4
1916	3,436.2	368.5	3,226.8

The term "designated first-class road" means surfaced road maintained by the caminero (cantonnier) system under specific agreement between the Insular Government and each separate province.

DEFINITIONS FOR ROAD CLASSIFICATION.

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are almost always supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all time with possible exceptions during typhoon periods.

Concrete Ford, Occidental Negros, constructed as overflow section.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing.

	December 31, 1916.	December 31, 1915.
	Kilometers.	*Kilometers.*
Stone	1,216.8	1,074.3
Gravel	2,455.4	2,249.9
Coral	920.4	958.3
Unsurfaced	4,333.5	3,919.1
Total	8,926.1	8,201.6

To systematically plan a road development program it is primarily essential to have a fixed source of revenue for the purpose. To this end Insular road and bridge funds are appropriated annually by the Legislature and are designated as Insular aid to the provinces. Since 1908 this Insular aid has been at the rate of approximately two million pesos per annum, representing one-sixteenth part of the total revenue of the Insular Government. The provincial road and bridge fund for all provinces approximates four million pesos per annum, making a total of six million pesos annually for road and bridge work. The liberality of the Insular Government in supporting the road development program will be appreciated when it is realized that Insular aid represents one-third of the total expenditures on road and bridge work.

The value of hard-surfaced roads is fully appreciated by the Filipino public. With few exceptions the Filipino farmer is ready to donate the necessary right-of-way for the construction of any proposed first-class road.

Appreciable progress has been made in perfecting the system of highway as originally planned. Intermediate sections between Manila and Nasugbu, Batangas, have been completed, thus offering a continuous first-class road for a distance of 193 kilometers. In like manner a continuous first-class road from Manila to Mabalacat, Pampanga, has been completed with a distance of 99 kilometers. But two comparatively short sections remain for the completion of the Manila-North road to the northern extremity of Luzon. In the

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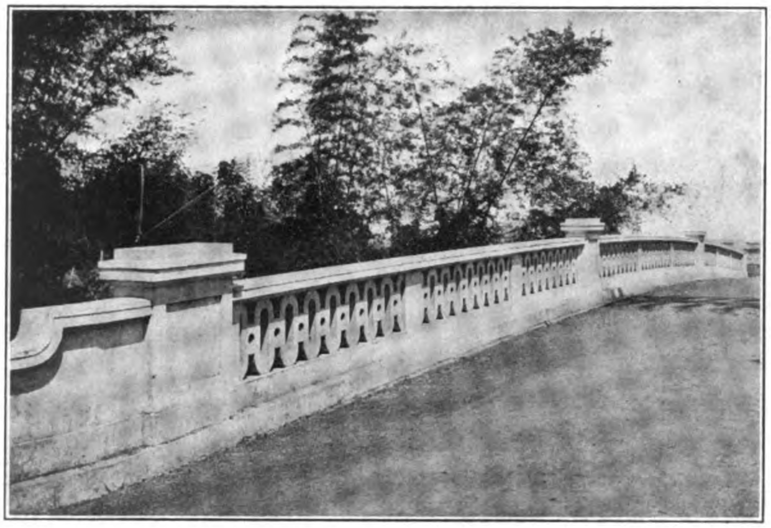


Bilibiran bridge, Rizal.

following provinces practically all municipalities have been connected up with improved highway communication:

- Albay.
- Ambos Camarines.
- Batangas.
- Bulacan.
- Cebu.
- Ilocos Norte.
- Ilocos Sur.
- Iloilo.
- Occidental Negros.
- Pangasinan.
- Rizal.

Projects authorized for 1917 will complete the road into Pagsanjan, Laguna, and will add a number of other important feeder roads. An important development project has been authorized through the construction of a road from San Jose, Nueva Ecija, to Imugen, Nueva Vizcaya, with a view to opening up direct highway communication with the Cagayan valley. The importance of this project cannot be overestimated. Of like importance is the inter-provincial road between Iloilo and Antique, which is also under construction.

ROAD MAINTENANCE.

Average Number of Kilometers Maintained.

	1915	1916
Caminero system	2,732.4	3,226.8
Gang system	2,692.2	2,800.4
Total	5,424.6	6,027.2

Total cost of road maintenance.

	1915	1916
Caminero system	₱1,258,114.15	₱1,642,404.93
Gang system	396,930.57	472,129.17
Total	1,655,044.72	2,114,534.10

Average cost of maintenance per kilometer per year.

	1915	1916
Caminero system	₱460.43	₱508.98
Gang system	147.44	168.51

The length of road designated first class and the length of road under caminero maintenance are as nearly identical as conditions permit.

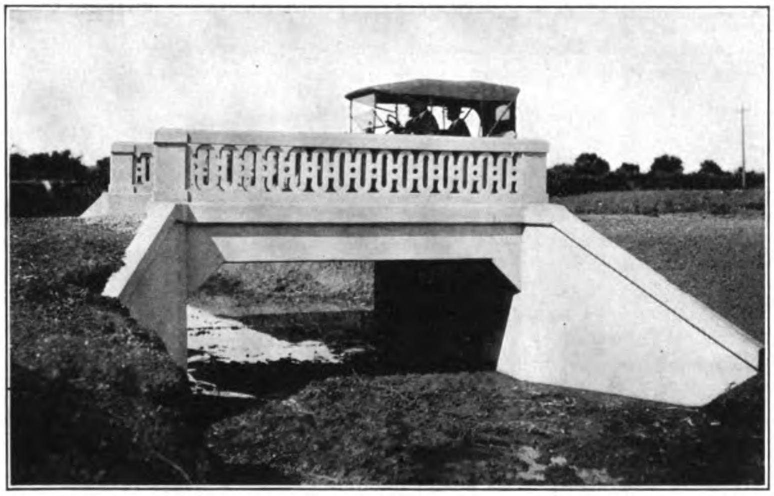
The higher maintenance costs as compared with previous years may be attributed almost wholly to the destructive effect on highways of heavy truck traffic and the ever increasing number of motor vehicles. Unless this traffic is properly regulated a further increase in maintenance expenditures must be anticipated.

BRIDGES.

Durable bridges and culverts in existence.

Fiscal year ending—	All durable structures.	
	Total number.	Increase during year.
December 31—		
1913	5,901	
1914	6,206	305
1915	6,640	434
1916	7,156	516

NOTE.—The term "Durable Bridges and Culverts" includes structures of reinforced concrete, steel, brick, and all substantial stone structures whether of adobe or other material. The increase in the number of structures is not identical with the number of structures built, not only because with the extension of the work of the bureau to new territory the old work existing is reported for the first time, but also because of the occasional loss of a structure. The above figures are obtained from semiannual reports of District Engineers, which are submitted for new territory at the earliest date permitted by conditions. Reports have been received from all provinces covered by organization of the bureau.



Concrete Culvert, La Union.

Reinforced concrete structures in existence.

Fiscal year ending—	Total number.	Total meter span.
December 31—		
1913	3,046	11,984
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and miscellaneous structures.

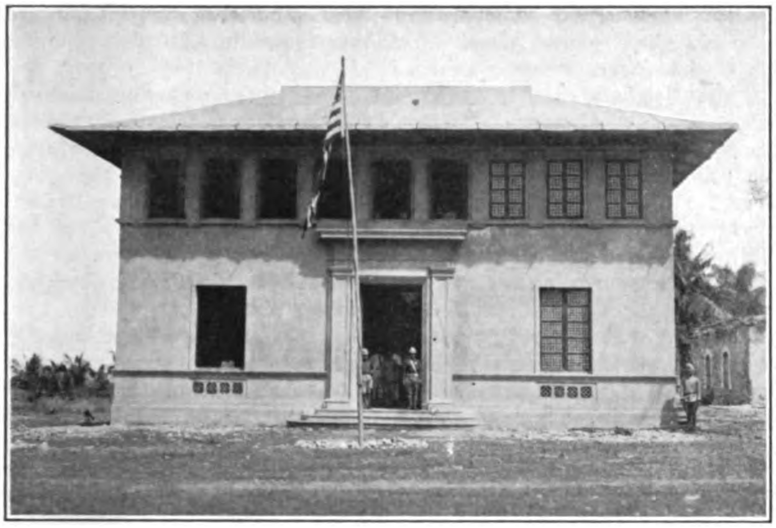
BUILDINGS.

The figures in the tabulation below exclude all structures of less than 100 cubic meters in content:

All durable buildings completed.

Fiscal year ending—	Total number.	Total content cubic meters.	Per cent reinforced concrete by content.
December 31—			
1914	136	270,723	92
1915	154	522,746	76
1916	112	261,496	85

Buildings, in these tabulations, are classified as reinforced concrete when the outside walls, or, in the case of markets, the interior posts, are of that material.



San Joaquin Presidencia (City Hall), Iloilo.

Number of markets and schools completed.

Calendar year—	Markets and tiendas.	Schools.
1913	37	51
1914	51	69
1915	54	72
1916	17	67

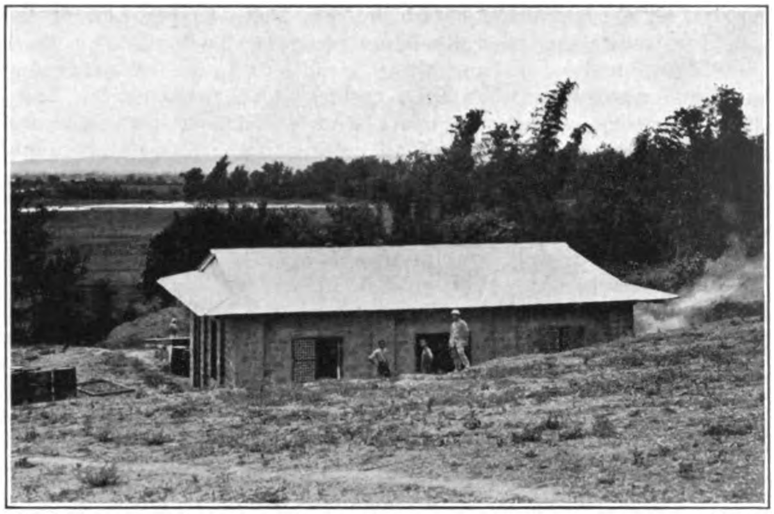
Bigaa School, Bulacan.

WATER SUPPLY.

Activities on the installation of water supply systems and the drilling of artesian wells extended quite generally over all the provinces. The following water supply projects furnish pure water to the number of inhabitants as shown:

Waterworks projects under construction during 1916.	Estimate cost of completd system.	Approximate population provided for.
Taal	₱75,000	16,000
Pasig	70,000	13,000
Loay	18,400	1,500
Kalapan	28,500	5,500
Moalboal	15,000	1,500
Parang	16,000	800
Zamboanga	300,000	5,100
Jolo	80,000	5,000
Bani	18,000	2,500
Kapis	12,000	8,000
Baguio	100,000	5,000
Total population provided for		63,900

The above projects remained in an uncompleted state at the close of the year owing to the difficulty in securing delivery of materials requisitioned from the United States.



Pumping station, Taal water supply.

Summary of deep-well driving, 1916.

	Number.	Total depth in meters.	Total flow in gallons per minute.
Successful—			
Flowing	35	3,915.0	1,258.5
Pumping	87	7,601.0	2,795.0
Total successful	122	11,516.0	4,053.5
Total unsuccessfel	13	2,189.0	

Expended upon completed artesian wells.

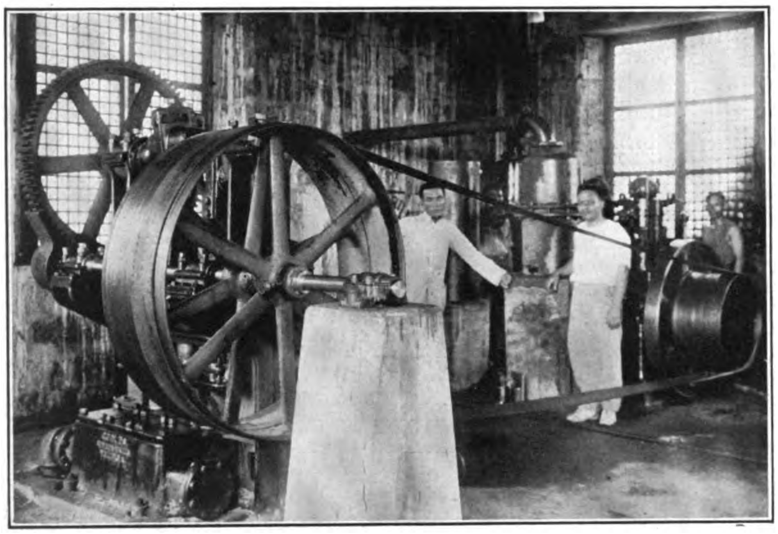
	1916		1915	
		Per cent.		*Per cent.*
Successful wells	₱199,058.80	85	₱215,920.49	80
Unsuccessful wells	35,646.64	15	53,673.00	20
Total	234,705,44	100	269,593.49	100

The new wells drilled during 1916 furnish potable water to a population of approximately 195,500.

The average cost of drilling, including pipe, supplies, depreciation of equipment and all charges was ₱19.73 per meter (₱6.02 per foot.).

Taal water supply, Batangas. Completed in 1916.

The question of properly maintaining artesian wells and water supply systems was given special attention. A detailed inspection showed that municipal officials in many cases neglected the item of repairs, as a consequence of which from 25 to 30 per cent of the pumping wells were generally in an unserviceable condition. Cases were also found where unsanitary conditions prevailed on flowing wells and waterworks. Under a regulation approved by the Executive Secretary, district engineers were directed to assume supervision over the maintenance of all artesian wells and water supply systems. Provision was made for a district machinery inspector who will make quarterly inspections, install all new pumps and execute all maintenance, alteration and repair work. It is contemplated that a full supply of spare parts will be carried in provincial stock, the municipalities to appropriate funds in the amount estimated for the maintenance of each well—these funds to be deposited with the provincial treasurer for disbursement subject to accounting regulations. The regulations also require the control of all flowing wells for the conservation of the under-ground supply. Investigations, covering a period of 18 months, in many cases showed depreciation of flow when additional wells were drilled in the same locality or where the constancy of flow depended upon the capacity of the subterranean basin forming the source of supply. It is believed that the precautions taken will be productive of the desired results.



Equipment installed, Taal water supply.

THE OPERATION AND REGISTRATION OF MOTOR VEHICLES.

The principal taxes imposed on motor vehicles in the Philippines are:

Vehicles.	First ton of capacity.	Each additional 500 kilos.
Trucks with metallic tires	₱50.00	₱4.00
Trucks with rubber tires:		
Passenger	10.00	2.00
Freight	25.00	3.00

Other four-wheel motor vehicles operated for hire, ₱0.20 per horsepower plus ₱20.

Motorcycles of two or three wheels, ₱3.

All other motor vehicles, ₱0.20 per horsepower.

For the fiscal year 1916 motor vehicles were registered as follows:

New registration	1,000
Re-registration	3,835
Total in actual use	4,835

Vehicles previously registered and withdrawn from service number 768. Of the total registration, 870 motorcycles and other motor vehicles having less than four wheels are included.

The funds collected during the year under existing law total ₱37,561.97, utilized as follows:

For the maintenance of first-class roads	₱28,520.02
For the payment of salaries, wages and other expenses incurred in the enforcement of the law	9,041.95

In the licensing of operators 1,432 applicants were examined and 555 new licenses issued. Including renewals 4,935 drivers were licensed to operate motor vehicles.

Attention is invited to the urgent necessity for amending the present automobile law as it relates to motor trucks. It is important that the use of steel tires for both motor trucks and their trailers be prohibited. Of equal importance is the limitation of the gross load for all motor vehicles, not to exceed four metric tons. The inferior grade of surfacing material and the yielding subsoil of the Philippines makes legislation along these lines imperative, as the economic condition of the country does not warrant the greater expenditure for more substantially constructed highways.

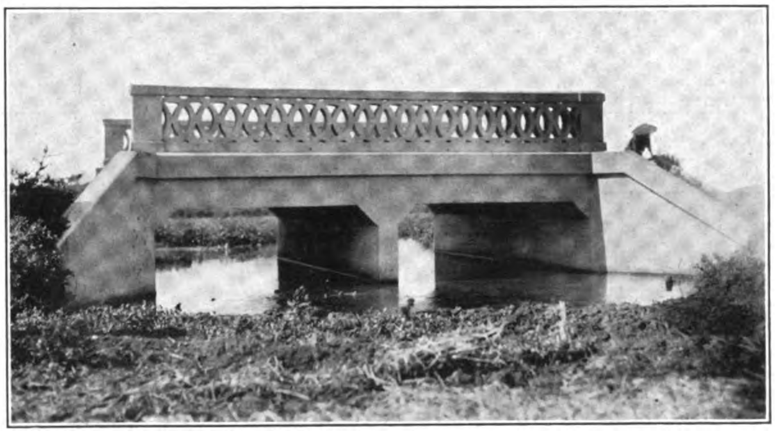
In view of the fact that motor vehicles traveling at a speed common for such vehicles do exceptional damage to water-bound macadam surfaces, it is recommended that they be taxed in a measure to offset the extraordinary wear on road surfaces as compared with other vehicles. The present tax of ₱0.20 per horsepower should be increased to not less than ₱1, preferably ₱2, that the rate of taxation may be in keeping with that of other countries.

BUREAU MOTOR TRANSPORTATION.

The automobile equipment for the central office includes eleven touring cars and runabouts of various makes. These cars are in constant use, being employed not only in the activities of this Bureau but also under regular assignment to the Executive Bureau and the two branches of the Legislature. The total operating cost for the Manila Automobile Division was ₱30,102.50. Two-thirds of this amount is properly chargeable to other Bureaus for transportation furnished.

THE PANAY AUTOMOBILE LINE.

The operation of the Panay Automobile line was discontinued by the Government and the equipment leased to a private concern at a nominal rental. It is recommended that the operation of this line be discontinued for economic reasons, it having been operated at a loss both under Government and private management.



A concrete Culvert.

BENGUET AUTO LINE.

The auto service for the Mountain Province as authorized under Act 2187 operated on the Benguet Road throughout the year without interruption. Expenditures under the following tabulation include the purchase of an additional passenger truck at a cost of ₱7,980.

Balance, January 1, 1916	₱60,250.37
Receipts	70,253.53
	130,503.90
Expenditures for 1916	84,986.14
Balance, January 1, 1917	45,517.76

It is observed that some Bureaus and Offices have excess transportation at times, while demands on other branches of the service are highly exacting. The centralizing of all Government motor transportation under a systematized control is recommended that operation and maintainance costs may be reduced to a minimum, all

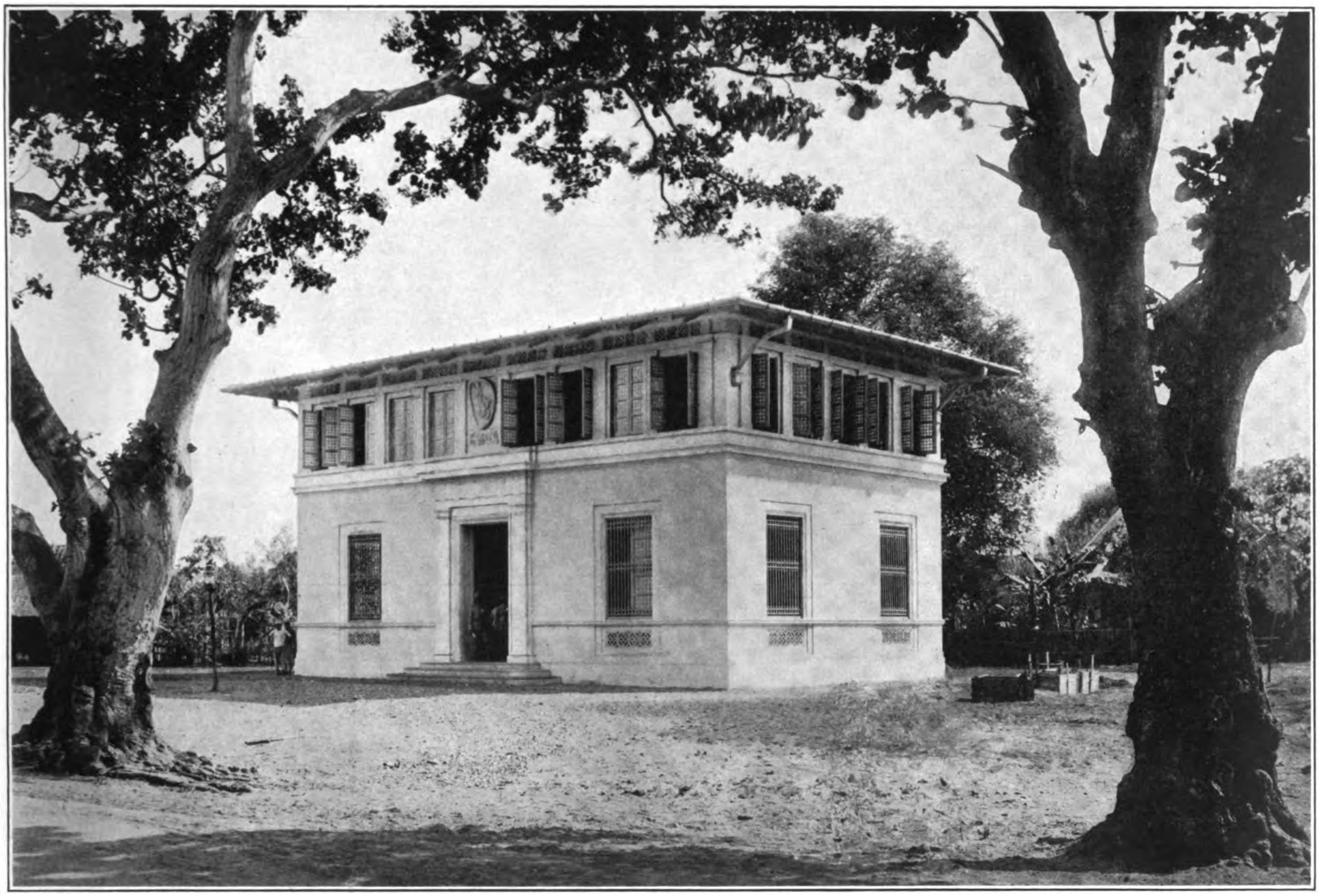
Government transportation used to the best advantage and necessity for the purchase of new motor transportation greatly limited. With the consolidation of all land transportation in one convenient place in the city of Manila, the service requirements of the different branches of the central government may be met with dispatch upon request, and charges made in accordance with the amount of transportation used.

DIVISION OF ARCHITECTURE.

RALPH HARRINGTON DOANE, Consulting Architect.

An unwillingness on the part of the Consulting Architect to use on Government buildings a tawdry system of ornamentation, together with the absence of local facilities for the manufacture of substantial architectural decorations, has produced until recently, an American architecture in the Philippines practically devoid of all embellishments. Such an architecture has naturally aroused adverse criticism from a population subject for centuries past to Latin influences and accustomed to consider, in the absence of a distinct local architecture of their own, the lavish Spanish colonial ecclesiastical architecture as their standard.

Due to improved methods of concrete building construction, and to an increased knowledge in the building trades of good architectural forms and ornament, a period has been reached in the development of American architecture in the Philippines when the local oriental and Latin desire for a richer expression of color and ornament in Government architecture may, within the bound of good taste, be satisfied.



Parañaque Presidencia (City Hall), Rizal.

Successful experiments have been conducted to secure a better color and texture to concrete buildings, and it is now possible to replace the cold natural gray of concrete by a warn, vibrant tone, similar in appearance to the best of natural building limestones and marbles.

Modelers in Manila have been trained in the manufacture of artificial stone ornaments, architectural motives, and specialties, appearing in the recent designs of public buildings, which may be shipped complete ready for assembling, to the various Government projects.

The ornamental cast-bronze banking screen, erected in the quarters of the Philippine National Bank, and manufactured under the direction of the division of architecture, although the first bronze work of the kind undertaken in the Islands, is distinctly metropolitan in its character, and as well being significant of the marked improvement in the artistic crafts, is also significant of the desire and ability of the division of architecture to introduce wherever suitable, a richness of architectural expression commensurate with the resources and dignity of the Government.

Architectural accomplishments in tactile form are always a year or even two behind architectural accomplishments as represented by drawings and designs.

Of the construction projects this year, the Iloilo Customhouse, the Sorsogon Provincial Building, Sorsogon courthouse and jail, together with the Manila School of Arts and Trades embrace and present in their completion a sophisticated architecture and a sophisticated solution of the problems of modern government edifices.

These buildings incorporate achievements indicative of broad and general improvements in building construction and in the products of

New Iloilo Customhouse.

the building trades. Avoiding mention in detail of their appointments, it may be said that these buildings incorporate all appropriate modern conveniences and are complete, administratively and architecturally. It is intended that the provincial buildings mentioned shall form in their respective locations, nuclei for Government centers which will be developed with suitable landscape accesories. The projects described represent an expenditure of ₱555,000.

During the year, architectural drawings have been prepared for 24 major architectural projects; 23 minor architectural projects; and 28 market projects.

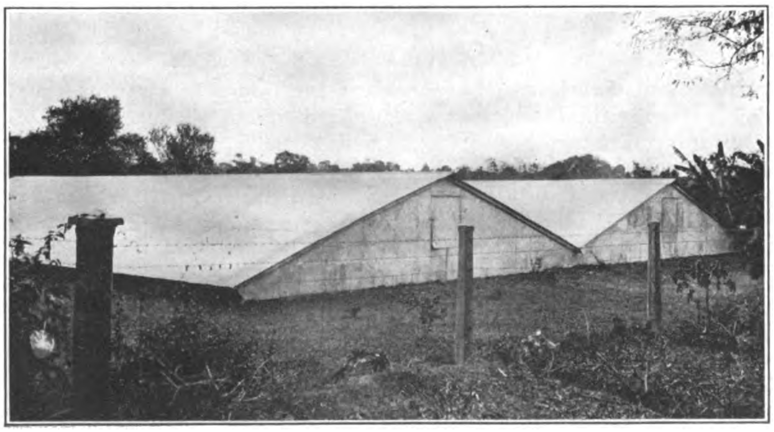
In addition to standard schools, markets, presidencias, and architectural projects, active building projects for 1917 will include:

Pangasinan Provincial Building, Lingayen.
Leyte Provincial Building, Tacloban.
Ilocos Norte Provincial Building, Laoag.
Zamboanga Normal School.
Zamboanga Contagious Disease Hospital.
Jones Bridge.
Municipal Building, Daet, Ambos Camarines.

DESIGNING DIVISION.

C. E. Gordon, Chief Designing Engineer.

The designing division has been greatly handicapped in the choice and class of materials desireable for construction because of the various limitations produced by the war, in the form of delayed transportation, high freight rates, war munition competition, and an attitude of indifference on the part of manufacturers supplying the materials desired. Substitution, and rearrangement, of reinforcing steel has been general and the construction of native timber truss bridges accelarated because of these conditions. The handicap has been especially manifest in the attempted utilization of waterworks and electrical supplies and machinery. Many places where galvanized iron pipe, in normal periods, would be placed, substitutes have been forced because of the practically prohibitive prices prevailing for galvanized pipe. If the war continues during 1917, the deterring conditions of 1916 will doubtlessly be greatly increased, with the concomitants of increased substitutions and delays obtaining.



Reservoir, Taal water supply.

In waterworks development, plans were amended and approved for the Zamboanga and Parang projects of the Department of Mindanao and Sulu. A concrete settling basin and river intake was designed for the Zamboanga project. Concrete tanks were designed as follows:

Baguio, Subprovince of Benguet.
Parang, Province of Cotabato.
Capiz, Province of Capiz.
Pasig, Province of Rizal.

Detailed and final plans were prepared for the following waterworks projects:

Pasig, Province of Rizal.
Jolo, Province of Sulu.
Bani, Province of Pangasinan.
Calapan, Province of Mindoro.
Moalboal, Province of Cebu, and
Loay, Province of Bohol.

Preliminary plans and estimates were prepared for water supply projects as follows:

Lipa, Province of Batangas.
Iloilo, Province of Iloilo.
Cagayan, Province of Misamis.
San Jose, Province of Antique.
Baguio, Subprovince of Benguet.
Santa Cruz Marinduque, Tayabas Province.
Pagsanhan, Province of La Laguna.
Lucena, Province of Tayabas, and
Tayabas, Province of Tayabas.

The above water supply systems have an estimated cost of approximately ₱2,000,000.

In the activity of water rights determination there is a very marked increase. During 1916, 625 applications for water rights, and 1,603 statements of existing water rights, were filed.

Several established irrigation systems have been taken up in the development of adjudication proceedings. The area of land directly affected by the proceedings now under way is, approximately, 49,500 hectares, having a valuation of approximately ₱58,000,000. There are additional cases which have not been taken up and which, consequently, are not included in the above. These may be taken up in 1917. Five survey parties have been, and are, employed upon the adjudication cases.

In the development of additional irrigation, activities have been limited because of the lack of funds for the procurement of essential hydraulic data. In the dispute between the Government and the Calamba Sugar Estate, it was necessary to establish a temporary hydrographical apparatus and await a few months delay and run-off data before being able to come to a conclusion. In the consideration by capitalists of a large sugar central at San Fernando, Pampanga, only fragmentary run-off records of the principal streams of central Luzon could be furnished. As hydraulic works cannot be designed properly unless based upon definite data covering a period of years, it is recommended that annual appropriation for hydrography be definitely determined upon; that dependable hydrographs be made of record and available for (1) adjudication proceedings in the settlement of pending water right controveries and (2) the design of waterworks, bridges and irrigation structures.

In the field of electrical and mechanical engineering, the Bureau rendered special services to the Board of Public Utility Commissioners in the settlement of engineering questions involving public service corporations. Plans and specifications have been prepared for an electric lighting plant at Taal, Batangas, and a preliminary plan and estimate has been prepared for an electric lighting plant at Lemery, Batangas. The mechanical features of the Diesel Engine plant installation of the Bureau of Printing and the electrical and mechanical features of the plant of the Trade School of the Bureau of Education were supervised. A pumping plant at Cebu, Province of Cebu, was designed, and an extended study and estimate has been made of a proposed hydro-electric plant for Zamboanga, Mindanao.

In the design of bridge structures, the work has been carried on in accordance with the best modern practice. Increasing attention to the aesthetics of design has been the rule. In general, Philippine bridges have shown a steady improvement in this respect.

A recent development, based partially upon experience in the United States, has been the low-level concrete bridge. The essential features are (1) a structure of sufficient waterway to pass dry weather flow, (2) deck at a somewhat lower level than the drift-carrying stage of the stream (3) approaches reaching back to the high-water contour, having the stability requisite to pass extreme floods. A concrete metalled-section is used which successfully stands submersion and resists current erosion for an appreciable period of time. This type of structure appears to be particularly suited to flashy streams, of considerable width between main banks, and to roads where traffic in stormy weather is difficult and sparse.

The work of preparing designs is necessarily heavier than is usual in engineering offices, on account of our practice of preparing complete bills of material for all work except building repairs. This is however justified by the increasing proportion of force-account construction, and the limited engineering personnel of the offices in charge of construction. The total estimated cost of bridge and port works for which designs and estimates were made exceeds ₱1,000,000.

CONSTRUCTING DIVISION.

D. E. HENRY, Chief Constructing Engineer.

ROAD PROJECTS.

Practically every province added to its kilometerage of first-class roads during the year. Batangas, Nueva Ecija, and Pampanga show increases of more than 20 kilometers each. A few of the more important road projects are:

Bangui-Claveria Road, (60 kilometers in length).—All work was done on an approved first-class road location that the status of the road may be raised from trail to first-class as funds are made available. Heavy rock-work characterizes the construction on both sides of the Pasaleng Valley, where the Caraballos Mountains drop off abruptly to the sea. Progress of work has been slow owing to the scarcity of labor.

Camp One-Aringay Road.—The subgrade and practically all culverts between Camp One and Agoo are completed. The last link in the Manila-North Road is thus being filled in. The location throughout is on a ruling gradient of 5 per cent and shows no curves having radii under 20 meters. The ₱75,000 allotment for 1916 was all spent on grading and structures. Funds have recently been provided for a continuation of the work.

Pili-Tigaon Road (Ambos Camarines Province).—With the special allotment of ₱75,000 for 1917 the entire road of 26 kilometers will be completed as first-class. It will be an excellent feeder for the railroad and will give the highly developed Partido District highway communication with the important towns of Camarines and Albay. The road when completed, including structures, will have cost ₱372,670.

Bohol Roads.—The most important highway development project on the Island of Bohol is the one from Loay to the hinterland of Batuan and Carmen. Twenty-three kilometers were surfaced with broken-stone during the year, the work reaching Bilar in December. The road is little more than half completed.

Samar Roads.—The Catbalogan-North Road is now surfaced for about eight kilometers out from Catbalogan, with hand-broken coralline limestone. The old location has been abandoned from kilometer 16 north to connect with the present Calbayog-South Road. The Catbalogan-South Road is now completed for about 11 kilometers out from the capital, or half-way to Wright. From this town will start the "Samar Contra-Coastal Road" to connect the east and west coast of the Island.

BRIDGE STRUCTURES.

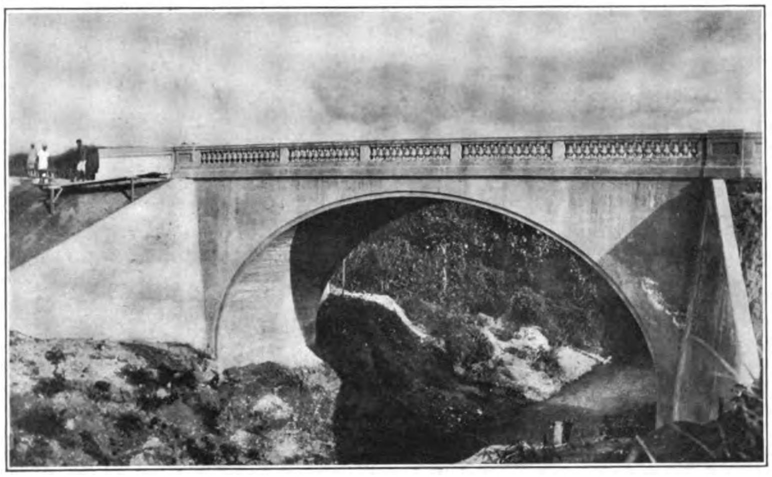
Important bridges completed or under construction during the year are located in the following provinces:

I. *Ambos Camarines.*—Five large bridges have been completed on the Pili-Tigaon Road, as follows:

Name of bridge.	Material.	Type.	Span.
			Meters.
Yapos	Concrete	Arch	15
Himaao	do	do	28
Hignaroy	do	do	28
Tinablanan	Steel	Truss	[a]37
Cagbanaba	Concrete	Deck girder	10

[a] 120 feet.

No unusual features, either of design or construction, are to be noted, except that the plans for four of the bridges were called in after the floods of 1915 for re-design with 50 to 100 per cent increase of waterway.



Yapos bridge, Province of Ambos Camarines.

II. *Batangas.*—Adobe stone was used to advantage, both economically and architecturally, in the abutments, spandrel walls and spandrel arches of the Mataywanac and Kaytitinga Bridges on the Tuy-Nasugbu Road. The arch and balustrades are of reinforced concrete. Mataywanac, 15.0 meter arch cost ₱17,417; Kaytitinga, 18.0 meter arch cost ₱16,082.

The Palico Bridge, consisting of two 48-foot steel deck truss approach spans and one 160-foot wooden Howe truss center span, was erected on the Tuy-Nasugbu Road. Both piers and abutments are of plain concrete on wooden pile foundations, the piers being designed to carry a steel bridge which will eventually replace the present wooden superstructure when steel prices again become normal. The bridge cost complete ₱59,600.

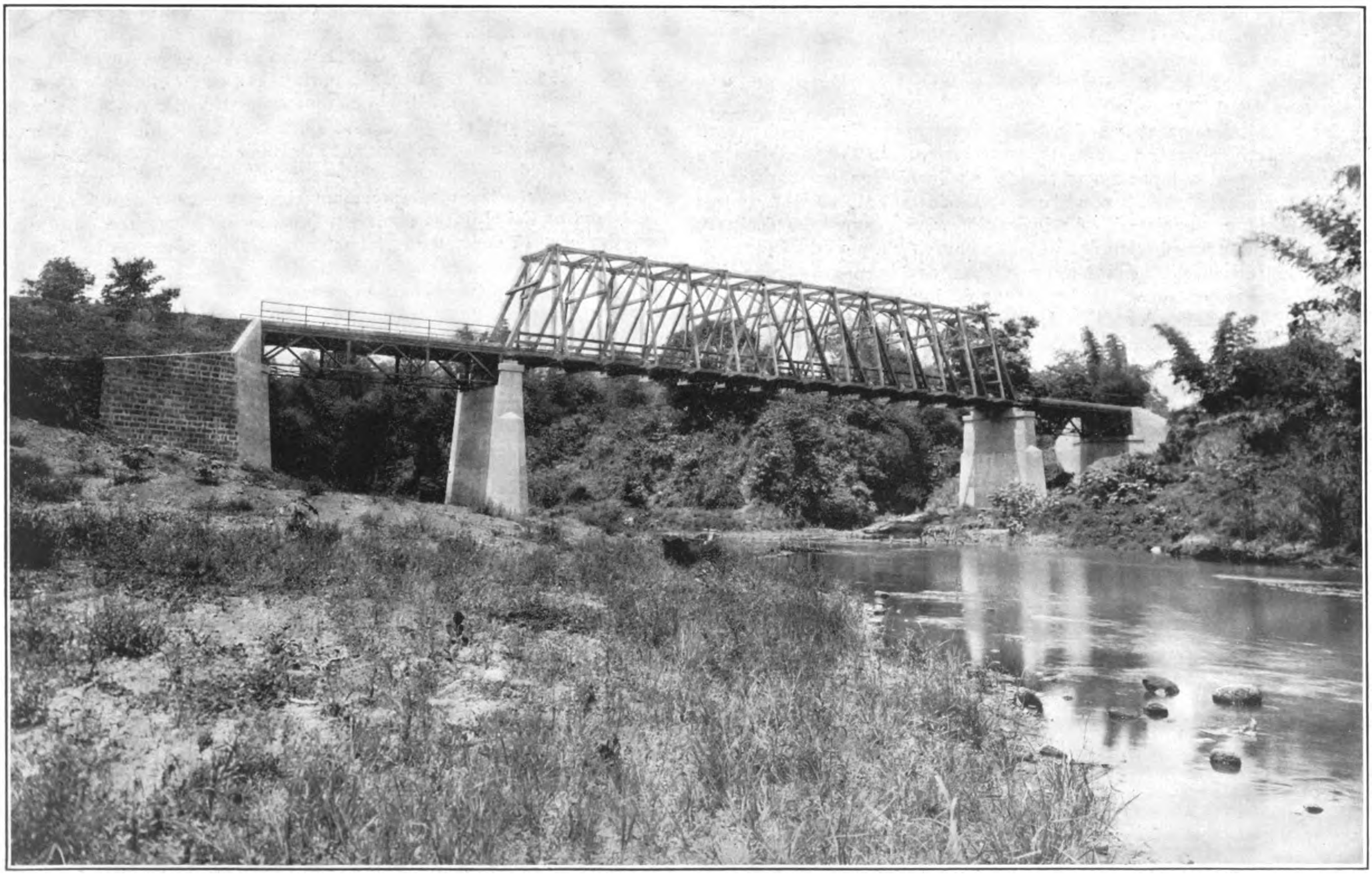
III. *Cagayan.*—The Babogan Bridge, over an estero of the same name on the Tuguegarao-Alcala Road, is a reinforced concrete deck-girder structure of nine spans, eight of 7 meters each and a central span of 12 meters. The latter is supported by reinforced concrete piers resting upon wooden piles, the others by standard reinforced concrete pile bents. The structure cost complete ₱47,703.

IV. *Capiz*—The Balucuan Bridge at Dao is a reinforced concrete arch of 22-meter clear span, on timber pile foundations, and built on a skew of 30 degrees from a normal to the course of the stream. Excavation for the abutments in 2 to 3 meters of water was successfully accomplished by means of an orange-peel bucket handled by the pile driver. Progress has been slow on account of excessive rainfall, which for the first five months of 1916 totalled 1,188 millimeters (46 inches).

V. *Laguna.*—The San Cristobal Bridge, built to replace a concrete arch lost in the 1915 floods, is a steel Pratt truss structure with concrete floor. The main span is 90 feet, the approach on either side being a steel I-beam span of 9 meters in length. Each pier rests upon two steel cylinders, assembled and sunk in place and filled with concrete after a sufficient number of wooden piles had been driven inside of each cylinder to carry the required load.

VI. *Leyte.*—The Mainit Bridge on the Tacloban-Carigara Road was completed by contract in March, 1916, at a cost of ₱51,889. It comprises two 120-foot span steel trusses with wooden floor. Test borings made before the bridge was advertised indicated soft sandstone for the pier foundations and a yellow sand clay for those of the abutments, in both cases at an elevation of 4 meters below water. No piles were used as actual excavation verified the test borings.

VII. *Occidental Negros.*—The plans for the Binalbagan Bridge on the Hinigaran-Isabela Road call for two 120-foot steel spans on rein-

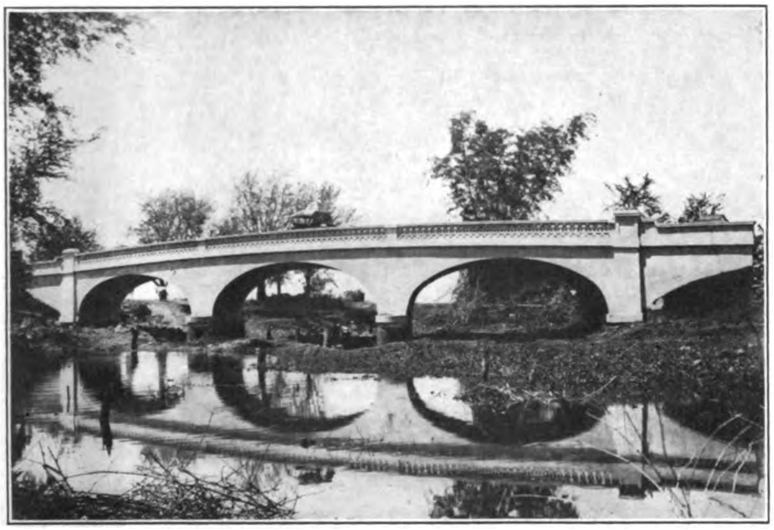


Palico bridge, Batangas-Nasugbu Road.

forced concrete abutments and central pier, all foundations being of timber piles. The pier was cast hollow, and by careful detailing the consequent high cost of form-work was more than offset by the saving in concrete. The abutments and wing-walls are also counterforted to economize in concrete. Owing to prohibitive war prices on structural steel the superstructure is to be built of wood. Another bridge deserving mention is the Pontevedra structure, on the road from Pontevedra to La Carlota, a typical reinforced concrete deck girder bridge of seven 7-meter spans on reinforced concrete pile bents. This bridge is the opening gun in a campaign to eliminate two wide ferries on the main road from Bacolod south. It was built by contract in eighty days at a cost of ₱19,720.

VIII. *Oriental Negros.*—With the completion in September of the 80-foot steel bridge at Bais all openings on the road from Dumaguete north to the Panambalon River, 51 kilometers, are now permanently bridged. The Bais Bridge is of the light steel highway design, riveted pony truss, wooden floor. The reinforced concrete abutments are carried by wooden pile foundations. Cost, complete, ₱27,035.

IX. *Rizal.*—The three reinforced concrete arched bridges on the Angono-Binangonan Road have been completed under one contract at a total cost of ₱48,000, or ₱630 per lineal meter of span. The Angono structure is a single arch of 20-meter span. The Bilibiran structure consists of three arches, a central one of 10-meter span and two flanking arches of 9-meter span each. The crown of the central arch is placed higher than that of the others, to reduce the approach fills and give the structure a more pleasing appearance. The bridge at Darangan is similar to the Bilibiran Structure, but built on a skew.



Darañgan bridge, Rizal.

X. *Tarlac.*—The substructure of the Camiling Bridge consists of two counterforted abutments of reinforced concrete and a central pier of plain concrete, all on wooden pile foundations. These were completed by administration in October. The steel for the superstructure, to consist of two 150-foot spans, pin-connected Pratt trusses, wooden floor, was contracted for a year ago but owing to abnormal freight conditions delivery has not been made.

PUBLIC BUILDINGS.

The shop building for the Philippine School of Arts and Trades, Manila, completed in May, 1916, at a cost of ₱197,550, is the largest and most complete building of its kind yet attempted in the Islands. It is roofed with Spanish tile laid on a concrete slab and covers an area of 4,022 square meters.

The original appropriation for the Iloilo Customhouse was ₱200,000. The work was done by administration and substantially completed within the estimate. Under the Public Works and Permanent Improvements Act for 1917, an additional appropriation of ₱33,000 was made for work not included in the original estimate nor contemplated under the bids submitted at the time the project was advertised. The new items include; counters and grilles for the post-office and customs bodega; louvre sashes for the first and second floor windows; partitions, shelves, plumbing and electrical installations on the third floor for the Bureau of Science; a temporary water supply system; razing the old concrete building and the parking of grounds, including walks and driveways.

Chemical Laboratory, University of the Philippines, completed June, 1916.

Customhouse, Iloilo (under construction).

A statement of comparative costs is submitted:

[Project inaugurated January 10, 1916.]

	Administration.	Contract.
Time to complete	430 days.	480 days.
Contractors' bid as compared with Administration cost, with omissions as under alternate proposal	₱185,650.00	₱216,454.00
124 piles omitted at ₱35		4,340.00
	₱185,650.00	₱212,114.00
Inspection 16 months at ₱150		2,400.00
Provincial surcharge (1 per cent)	1,856.50	2,145.14
Insular surcharge (9 per cent)	16,875.50	19,499.32
	₱204,382.00	₱236,158.46

Other large building projects completed during the year are as follows:

Projects.	Location.	Cost.
Postigo Building	Manila	₱76,171.41
Provincial Building	Sorsogon	76,270.49
Provincial jail	do	72,994.83
San Lazaro Kitchen	Manila	21,857.79
Engineering Laboratory	do	34,453.67

Fifty-eight school buildings were constructed during the year from Bureau of Education standard plans as follows:

Plan.	Number.	Average cost.
No. 2	9	₱5,216
No. 3	9	8,342
No. 4	8	9,577
No. 5	1	8,935
No 6	6	12,560
No. 7	16	16,880
No. 10	5	21,179
No. 10 (wood)	1	6,743
No. 14	1	39,240
No. 20	2	34,193
No. 20 (revised)	1	57,993

The last building in the list is the Rizal Memorial School located at Calamba, Laguna. The standard plans were so modified in this case as to give a very commodious and imposing structure, resulting in the higher cost.

Eleven public market buildings were completed, in nine different provinces, with a total floor space of 8,002 square meters, and at a cost of ₱23.42 per square meter.

WATERWORKS CONSTRUCTION.

The largest and most important waterworks development of the year obtained at Zamboanga. This project is of the gravity type, is a well conceived proposition, and because of its proportions it may be several years before the entire conception is materialized. The waterworks feature is almost completed, and shortly the materialization of the purely electrical feature will be undertaken. With the construction of the electrical feature, the irrigation feature will have been accomplished, and the utilization of electric energy relative to sewerage disposal will be a potentiality. The principal feature of the project is the waterworks. The source of the supply is the Tumaga River, the water shed of which is forested and singularly free of susceptibility to pollution. All of the water will not be required for domestic consumption, and consequently about 270 horsepower may be developed electrically for lighting and power consumption in the town. The water upon leaving the tail race of the power plant is to be conveyed through an existing canal to the irrigation of about one thousand hectares of excellent agricultural land located near the town. In the future, when sewerage disposal is undertaken, the electrical energy may be utilized, in part, to drive electrically operated sewerage pumps. The topography upon which Zamboanga is built is rather low in elevation and nearly level, and consequently the sewerage disposal method must be limited to a system similar to that of Manila. Because of the correlative features of the project, the ultimate segregation of the estimated cost, exclusive of the comparatively remote sewerage feature, is estimated as follows: Waterworks, ₱216,000; hydro-electric plant, ₱180,000; irrigation, ₱9,000. The above forms a total of ₱405,000 for the completed project. About ₱300,000 have been already expended.

The cardinal features of other waterworks completed or under construction are—

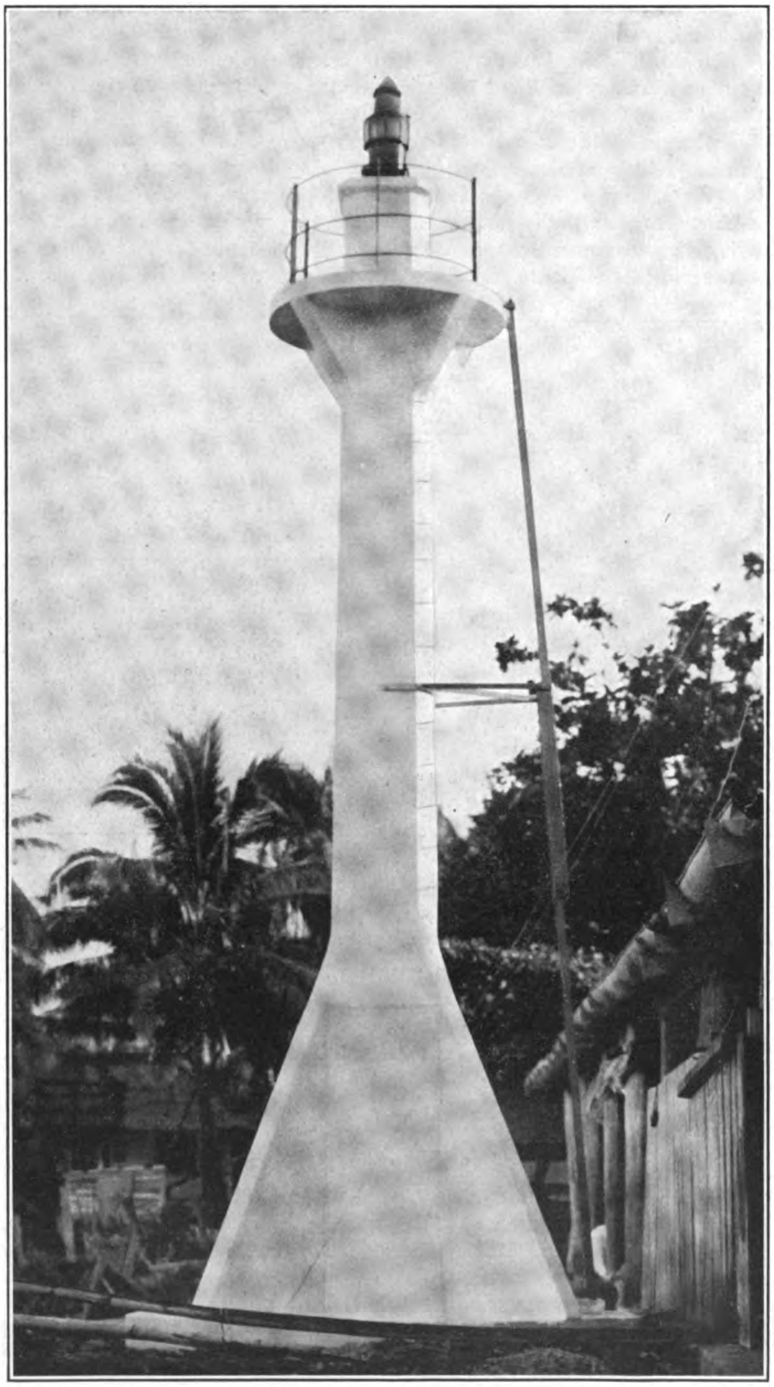
Place.	System.	Capacity per day.
		Liters.
Taal, Batangas	Pumping	1,140,000
Baguio, Benguet	do	1,700,000
Loay, Bohol	Gravity	740,000
Sibonga, Cebu	do	240,000
Moalboal, Cebu	do	210,000
Parang, Cotabato	Rams	60,000
Calapan, Mindoro	Pumping	190,000
Bani, Pangasinan	Gravity	380,000
Jolo, Sulu	Rams	435,000
Pasig, Rizal	Pumping	340,000

A rain-water supply has been installed for the town of Capiz. The water is caught from roofs of government buildings and conveyed to a reinforced concrete circular tank of 1,000,000 liters capacity. Cost ₱12,000. In the Mountain Province all subprovincial capitals, except Kabugao, have installed small gravity water supply systems.

LIGHTHOUSES.

Standard 28-foot reinforced concrete towers for automatic acetylene lights were built at the following locations:

Jinamoc Island, Samar Province.
Mariquitdaquit, Samar Province.
Tinaca Point, Cotabato Province.
North Ubian Island, Sulu Sea.
Fortune Island, Batangas Province.
Port Bolinao, Pangasinan Province.
Hermano Mayor Island, Zambales Province.
Pandan, Ilocos Sur Province.
San José, Antique Province.
Amblan Point, Oriental Negros Province.
Pescador Island, Cebu Province.
Port San Vicente, Cagayan Province.



An automatic acetylene flashing light.

Concrete beacons of special design were placed on the Iloilo jetties and at Bogo Harbor, Cebu Province; steel towers erected at Nogas Island, Antique Province, and Port Matalvi, Zambales Province; and wooden towers built at Donsol, Sorsogon Province, and Mambajao and Misamis, Misamis Province; all for the accomodation of automatic acetylene lights.

Regulation range beacons were installed at the Rapurapu Straits, Albay Province, and at Bogo Harbor.

PORT WORKS.

I. *Manila.*—The new concrete wharf between Piers 3 and 5, construction of which was commenced in 1915 was completed at a cost of ₱222,997. The available docking space for Piers 3 and 5 is thereby increased by 222 meters, the length of the new structure.

The Pasig River quay, of reinforced concrete construction, extends from the Roxas Bridge to Callejon Soda, a distance of 220 meters. The project was completed on administration account at a total of ₱61,985.64, representing a saving of more than ₱18,000 as compared with the lowest bid submitted.

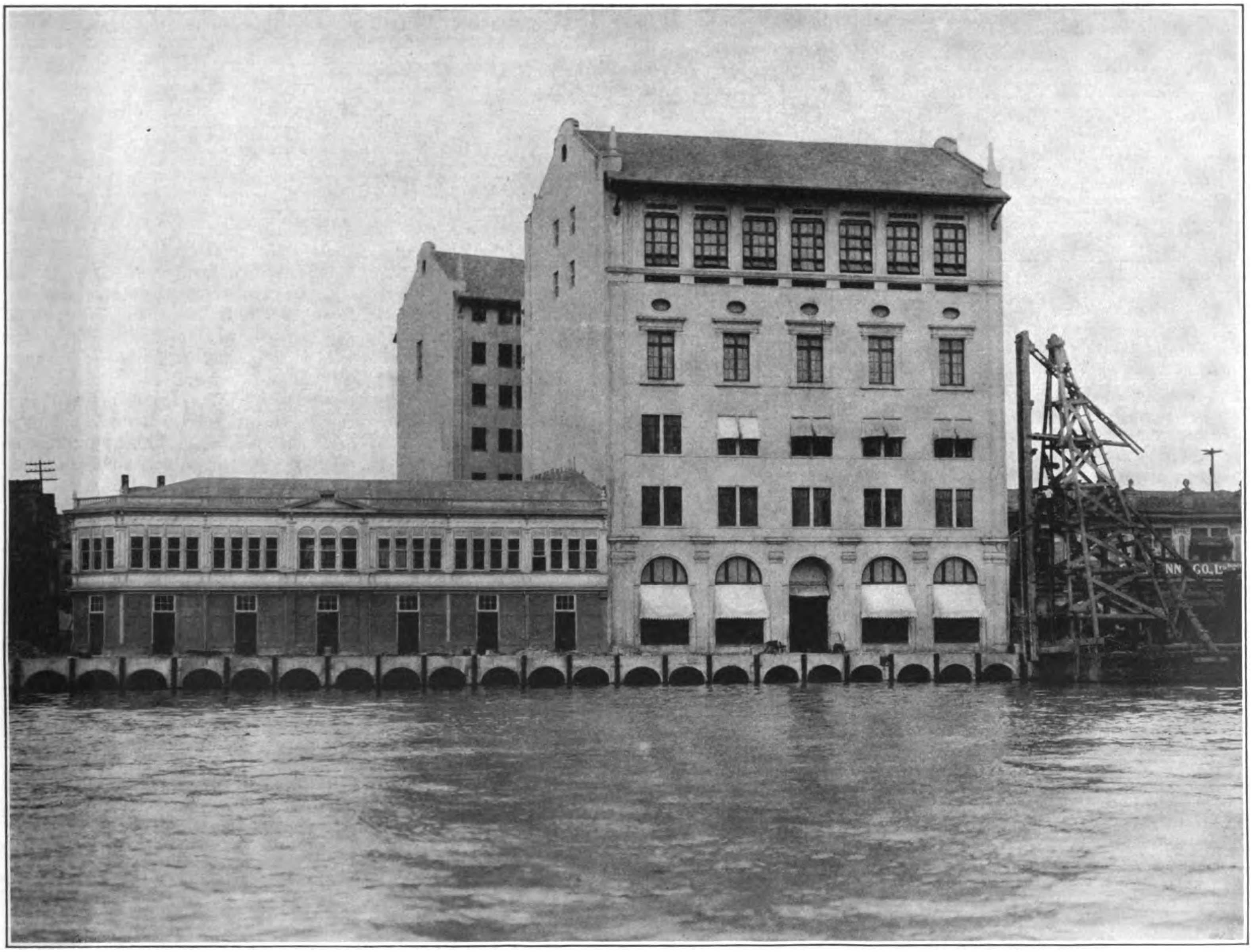
II. *Iloilo.*—The Iloilo River channel was maintained through dredging operations, a portion of the dredged material being hydraulically deposited for the filling of the Customhouse and highschool grounds. Reinforced concrete wharf construction was extended under contract for a distance of 70 meters at a cost of ₱57,703.

III. *Bohol.*—The port of Tagbilaran is being improved through the removal of a coral reef barrier which has constituted a serious obstruction to navigation. A contract has been let for the cutting of the channel 45 meters wide with a 4.6-meter (15-feet) depth at mean low water. Seven beacons will be installed to guide vessels through the barrier. The project will cost, complete, approximately ₱40,000.

IV. *Surigao.*—The wharf at Surigao was completed in September 1916. It is a reinforced concrete structure, 9 by 50 meters in plan, and of the deck girder design with concrete piles. Cost, ₱40,238.

V. *Misamis.*—The Cagayan wharf, a reinforced concrete structure on concrete piles was completed under contract at a cost of ₱41,197. The wharf is U-shaped in plan, and has a shipside frontage of 47.5 meters. Eventually the inclosure within the U will be filled and the land so reclaimed used as a site for warehouses.

VI. *Samar.*—The work at Calbayog consists of a single jetty at the mouth of the Calbayog River. The usual bar is caused partly by the alongshore current, which the jetty is designed to intercept. The structure is curved in plan, concave to the shoreline and thus creates what is in effect a bend in the river, with consequent deep



Pasig River Quay, Manila.

Established building line as represented by the new Masonic Temple building leaves a 13-meter (40-ft.) street inside of the harbor line.

water along the jetty. In cross-section the jetty is a riprap dike, 1 meter wide on top, with slopes of 1 on 2 on the sea side and 1 on 1⅓ on the channel side. The work is being done under contract, estimated to cost ₱50,000.

VII. *Zamboanga.*—The Zamboanga wharf is a reinforced concrete deck-girder structure on concrete piles. It is of the hammer-head type, 13.6 meters wide, with a shipside frontage of 90.2 meters. The bottom in front of the wharf drops abruptly to the deep water of the Basilan Straits, thus maintaining a depth of approximately 9 meters (30 feet).

Dredging operations were carried on during the year according to the following tabulation, the quantities given being cubic meters of materials moved. The Bureau now owns and operates six dredges of various types and capacities, a 15-inch hydraulic dredge having been lately added to replace one condemned and sold in 1914.

Locality.	Total from 1902 to 1915.	Fiscal year 1916.	Total.
Lower Pasig River	5,203,750	508,283	5,712,033
Outer Harbor	1,266,708	508,510	1,775,218
Upper Pasig River	654,834	8,992	663,826
Inner Basin	232,752	127,460	360,212
Binondo Estero	52,816		52,816
Estero de la Reyna	205,791	26,517	232,308
Paco Estero	17,200		17,200
San Miguel Estero	50,520	432	50,952
Proviso Estero	21,148		21,148
Marine R. R. Engineer Island	11,122	19,743	30,865
Talim Island (city)	1,071		1,071
Outer Bar	452,172	11,529	463,701
San Sebastian Estero	3,556		3,556
Magdalena Estero	3,000	4,098	7,098
Engineer Island Canal	30,180		30,180
Vitas Estero	240,827		240,827
Quiapo Estero	5,723		5,723
Cegado Estero	35,509		35,509
Pandacan Estero	172		172
Estero de San Lazaro	3,213	19,762	22,975
Corregidor Basin, Q. M		54,956	54,956
Iloilo River	1,026,324	331,500	1,357,824
Cebu Harbor	154,084		154,084
Mariquina River	7,290		7,290
Balete Estero	14,849		14,849
District of Cavite		20,876	20,876
Total	9,694,611	1,642,658	11,337,269

CONVERSION TABLE.

One peso (₱) =50 cents, United States Currency.
=0£ 2s. 0.74d
One kilometer (km) =0.62 miles.
One kilogram (kg) =2.20 pounds (lbs.).
One centimeter (cm) =0.39 inches.
One meter (m) =3.28 feet.
One hectare (ha.) =2.47 acres.
One cubic meter (cu. m.) =1.31 cubic yards.
One hectare meter per day =8.107 acre feet per day.
One liter per second (second liter) =0.0353 cubic feet per second (cu. sec.) (second feet)

FINANCIAL.

Loans for roads, bridges, schools, markets, municipal and provincial buildings, waterworks, etc. from January 1, 1917, to March 31, 1917.

Provinces and projects.	Act Nos.			Total.
	1728.	1749.	2083.	
Antique:				
Sibalom market			₱18,000	₱18,000
San Jose de Buenavista market			15,000	15,000
Batangas:				
Dayapan and Paninsiñgin Bridges on the Ibaan-Rosario Road			40,000	40,000
Bolbok market		₱17,000		17,000
Lipa municipal building		11,000		11,000
Iloilo: La paz market			20,000	20,000
Laguna: San Pablo garbage crematory and installing a garbage collection service	₱5,000			5,000
Rizal:				
Antipolo kioskos			3,200	3,200
Do			6,200	6,200
Pasig bridge over the Pariancillo River	7,500			7,500
Sorsogon: Gubat market			15,000	15,000
Total	12,500	28,000	117,400	157,900

ANTIQUE.

For the purpose of purchasing a market site and erecting modern market buildings thereon, a loan of ₱18,000 is hereby granted the municipality of Sibalom, Province of Antique, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 3 per centum per annum.

Payments.	Principal.	Interest.
First	₱1,800	₱540
Second	1,800	486
Third	1,800	432
Fourth	1,800	378
Fifth	1,800	324
Sixth	1,800	270
Seventh	1,800	216
Eighth	1,800	162
Ninth	1,800	108
Tenth	1,800	54

For the purpose of constructing a modern market building with sanitary tables and midden shed, a loan of ₱15,000 is hereby granted the municipality of San Jose de Buenavista, Province of Antique, payable in ten equal annual installments due in one, two, three four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan together with interest, payable quarterly, at the rate of 3 per centum per annum.

Payments.	Principal.	Interest.
First	₱1,500	₱450
Second	1,500	405
Third	1,500	360
Fourth	1,500	315
Fifth	1,500	270
Sixth	1,500	225
Seventh	1,500	180
Eighth	1,500	135
Ninth	1,500	90
Tenth	1,500	45

BATANGAS.

With further reference to the communication of the Governor-General dated March 27, 1915, granting a loan of ₱165,000 to the Province of Batangas, for the purpose of constructing bridges on the Tuy-Nasugbu Road, I have to request that the balance of ₱40,000 remaining unreleased be placed immediately to the credit of the Provincial Treasurer of Batangas, for the construction of the Dayapan and Paninsiñgan Bridges on the Ibaan-Rosario Road. The letter of the Governor-General above referred to is hereby amended accordingly.

As previously stated, this loan will be made from the gold standard fund as fixed by Act No. 2083, as amended, and will bear interest at the rate of 3 per centum per annum. This installment will complete the entire loan of ₱165,000 and will be repaid as follows:

Year.	Principal.	Interest.
1917		₱1,200
1918		1,200
1919		1,200
1920		1,200
1921		1,200
1922		1,200
1923	₱7,000	1,200
1924	16,500	990
1925	16,500	495

For the purpose of purchasing a site and erecting modern market buildings thereon, a loan of ₱17,000 is hereby granted the municipality of Bolbok, Province of Batangas, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

Payments	Principal.	Interest.
First	₱1,700	₱680
Second	1,700	612
Third	1,700	544
Fourth	1,700	476
Fifth	1,700	408
Sixth	1,700	340
Seventh	1,700	272
Eighth	1,700	204
Ninth	1,700	136
Tenth	1,700	68

For the purpose of purchasing the building now occupied and used as a municipal building, a loan of ₱11,000 is hereby granted the municipality of Lipa, Province of Batangas, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

Payments.	Principal.	Interest.
First	₱1,100	₱440
Second	1,100	396
Third	1,100	352
Fourth	1,100	308
Fifth	1,100	264
Sixth	1,100	220
Seventh	1,100	176
Eighth	1,100	132
Ninth	1,100	88
Tenth	1,100	44

ILOILO.

For the purpose of purchasing a site in the barrio of La Paz, and erecting modern market building thereon, a loan of ₱20,000 is hereby granted the municipality of Iloilo, Province of Iloilo, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 3 per centum per annum.

Payments.	Principal.	Interest.
1917	₱2,000	₱600
1918	2,000	540
1919	2,000	480
1920	2,000	420
1921	2,000	360
1922	2,000	300
1923	2,000	240
1924	2,000	180
1925	2,000	120
1926	2,000	60

LAGUNA.

For the purpose of constructing a garbage crematory and installing a garbage collection service, a loan of ₱5,000 is herby granted the municipality of San Pablo, Province of Laguna, payable in two equal installments due in one, and two years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

Payments.	Principal.	Interest.
First	₱2,500	₱200
Second	2,500	100

RIZAL.

Referring to the communication of the Governor-General of December 23, 1916, granting a loan of ₱14,000 from the gold standard fund, to the municipality of Antipolo, Province of Rizal, for the purpose of purchasing land for the erection of kioskos, I have to request that ₱3,200 of said amount be placed for disbursement to the credit of the provincial treasurer of Rizal on January 2, 1917.

The annual payments, including interest due, when collected will be credited as follows:

Payments.	Act No. 2083.	
	Principal.	Interest.
1918		₱96
1919		96
1920		96
1921		96
1922		96
1923		96
1924		96
1925	₱1,000	96
1926	1,000	66
1927	1,200	36

Referring further to the communication of the Governor-General of December 25, 1916, granting a loan of ₱14,000 from the gold standard fund to the municipality of Antipolo, Province of Rizal, for the purpose of purchasing land for the erection of kioskos, I have to request that ₱6,200 of said amount be immediately placed for disbursement to the credit of the provincial treasurer of Rizal.

The annual payments, including interest due, when collected, will be credited as follows:

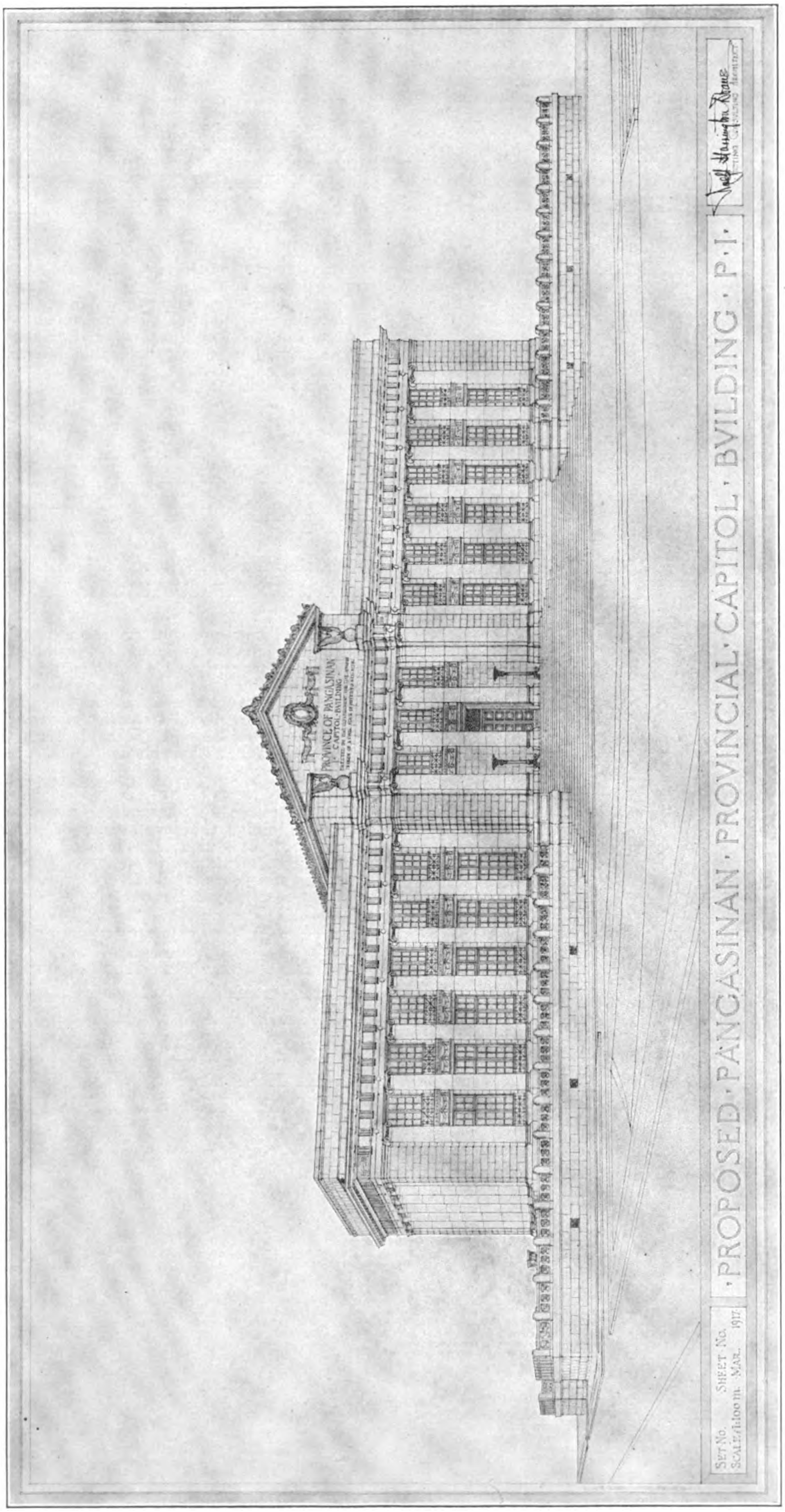
Payments.	Act No. 2083.	
	Principal.	Interest.
1918		₱186
1919		186
1920		186
1921	₱500	186
1922	1,500	171
1923	1,500	126
1924	1,500	81
1925	500	36
1926	500	21
1927	200	6

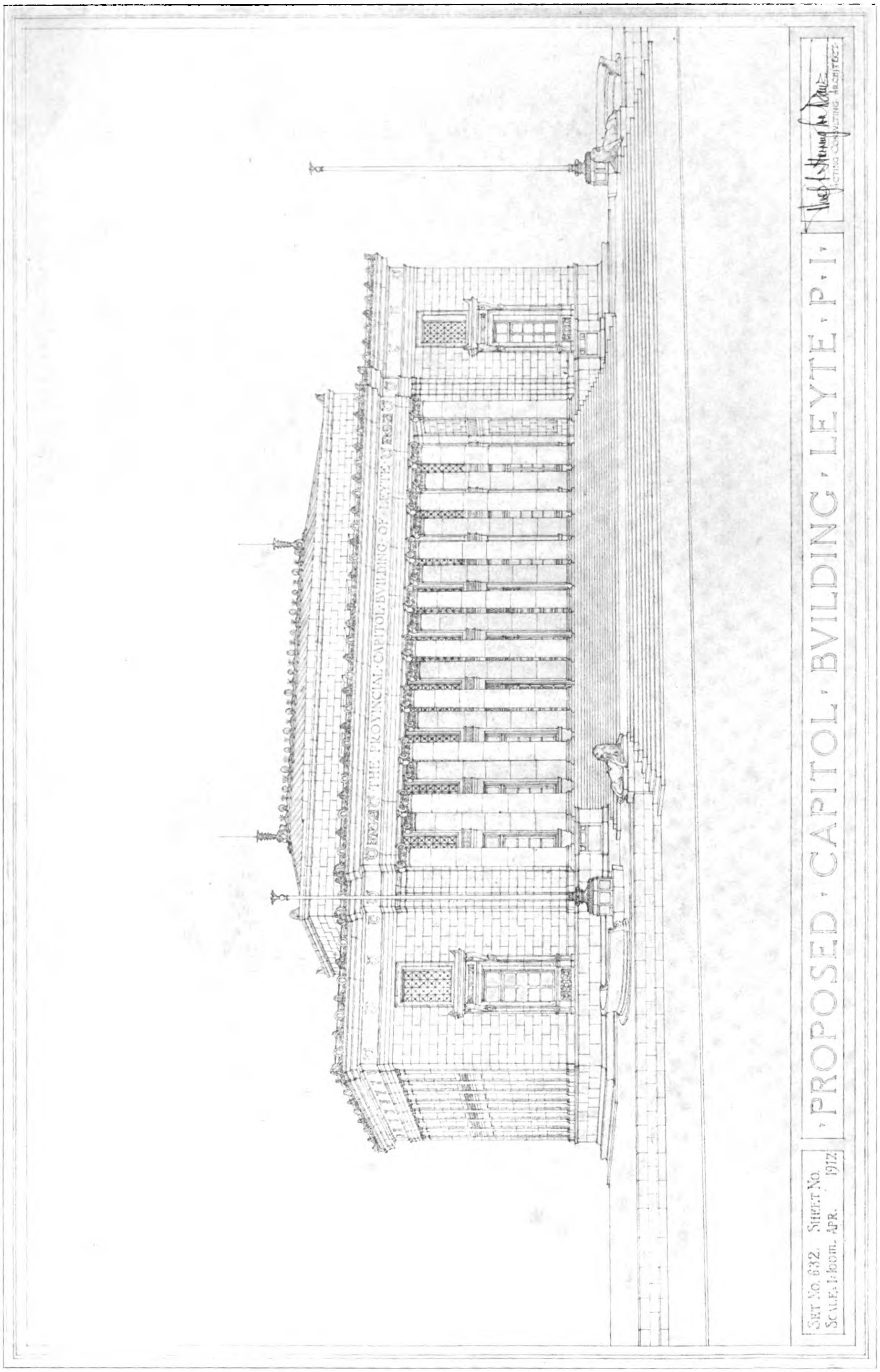
For the purpose of constructing a bridge over the Pariancillo River in the Municipality of Pasig, a loan of ₱7,500 is hereby granted the Province of Rizal, payable eighteen months from date, together with interest, payable quarterly, at the rate of four per centum per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Rizal who should be advised accordingly. This loan will be made from the insurance fund, created by Act No. 1728, as amended.

SORSOGON.

For the purpose of purchasing a market site and erecting modern market buildings thereon, a loan of ₱15,000 is hereby granted the municipality of Gubat, Province of Sorsogon, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 3 per centum per annum.

Payments.	Principal.	Interest.
First	₱1,500	₱450
Second	1,500	405
Third	1,500	360
Fourth	1,500	315
Fifth	1,500	270
Sixth	1,500	225
Seventh	1,500	180
Eighth	1,500	135
Ninth	1,500	90
Tenth	1,500	45


PROVINCE OF PANGASINAN
CAPITOL BUILDING
SET No. SHEET No.
SCALE 1:100 m. MAR. 1917
·PROPOSED·PANGASINAN·PROVINCIAL·CAPITOL·BVILDING·P·I·
Ralph Harrington Doane
Acting Consulting Architect


THE PROVINCIAL CAPITOL BUILDING OF LEYTE
PROPOSED CAPITOL BUILDING LEYTE P. I.
ACTING CONSULTING ARCHITECT.
SET NO. 632. SHEET NO.
SCALE, 1:100m. APR. 1912.

SELECTED.

"Business is Business," the Little Man said,
"A battle where 'everything goes,'
Where the only gospel is 'get ahead,'
And never spare friends or foes.
'Slay or be slain,' is the slogan cold;
You must struggle and slash and tear,
For Business is Business, a fight for gold,
Where all that you do is fair!"

"Business is Business," the Big Man said,
"But it's something that's more, far more;
For it makes sweet gardens of deserts dead,
And cities it built now roar;
Where once the deer and the gray wolf ran
From the pioneer's swift advance;
Business is Magic that toils for man,
Business is True Romance."
[*Anonymous in Trumbull Cheer.*]

APPENDIX A.

CIRCULAR LETTERS ISSUED BY THE CONSTRUCTING DIVISION FROM JANUARY 1 TO MARCH 31, 1917.

Manila, *P. I., February 23, 1917.*

Constructing Division Memorandum No. 6.

Sir: Your attention is invited to the following communication received from the Director, Bureau of Science:

"Sir: I have the honor to request that samples of as many of the concrete structures which have failed in the Philippine Islands as possible be forwarded to this Bureau. It is requested that the sample be accompanied by as much information as possible with regard to the brand of cement used, when and where tested, the character of the aggregate, water used in mixing the concrete, etc. Information with regard to the technique of the operation, the engineer responsible for the work, etc. will also be appreciated. Whenever possible 5 to 10 liters of water from the same source as that with which the concrete was mixed should be sent in.

Very respectfully.

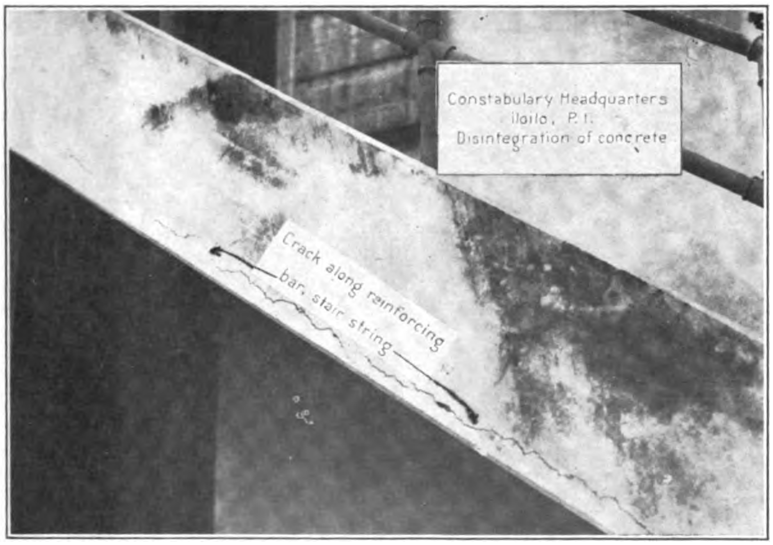
(Sgd.) Alvin J. Cox,
Director, Bureau of Science."

It is desired that samples be submitted at the earliest possible date from all structures showing signs of disintegration. Concrete samples should be as large as is convenient, and if available samples of sand (about 10 liters) and of water (5 or 10 liters) from the same sources as those used in the original construction should be forwarded. All samples should be marked for easy identification.

Use the attached forms in collecting and listing data, submitting a separate report for each failing structure. Attach to bill of lading all reports, photographs and other data pertaining to the samples making up the shipment, and mail to Director of Public Works, Manila. Consign all samples to the same address.

The information sought through the studies proposed is intended primarily for the benefit of the Bureau of Public Works. If it is to be of any value, the data submitted by field engineers must be *accurate* and as full as is humanly possible. Such data as was received in response to Circular No. 172, is not complete enough to be of value while some district engineers have not yet replied in any form although this circular (No. 172) has been in their hands for nearly a year.

Photographs showing failures of concrete are especially desired. The attached print shows the sort wanted. Charge photograph expense to your "Engineering Expense" account. "Character of failure" (paragraph 11 of the attached form) should receive particular attention. This information should be especially full and complete.


Constabulary Headquarters
Iloilo, P. I.
Disintegration of concrete
Crack along reinforcing bar, stair string

Samples of sand and water "if available" are desired. Make some effort to the end that they be "available."

It is desired that you state the conditions of exposure of concrete in question, as "in salt water below low tide," "between high and low tide," "above high tide," "in fresh water," "(number of), kilometers, air line, from salt water," etc. (See paragraph 10, attached form).

Give your own impressions as to cause, character, extent, etc., of failure. A careful study of the question of deterioration of concrete should be preliminary to such statement.

The source of information should be given in every case.

In this connection, attention is invited to several possible causes of deterioration of concrete, as follows:

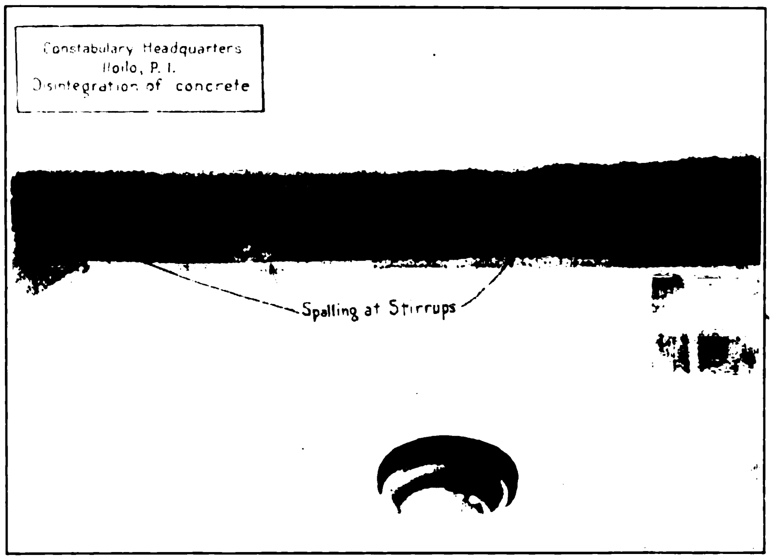
(*a*) Deteriorating cement, (unsound).

(*b*) Porous concrete resulting from too little cement, poor aggregates or workmanship, leaky forms, etc.

(*c*) Weakness of mortar from laitance due to use of excess water in gauging.

(*d*) Corrosion of reinforcement, consequent increase in section of bars and splitting of concrete.

(*e*) Deterioration of cement due to submergence of concrete in salt water.



It is desired that this matter be given early attention and that as complete a lot of samples be submitted as are available. *Immediate* and *personal* activity on the part of engineers in charge of districts and divisions is expected.

This memorandum, with attached "Form for Submitting Data on Failing Concrete," supersedes Constructing Division Circular No. 172. Both memorandum and sample form are to be kept *in sight* on your desk until their requirements have been fulfilled, and then, and not until then, filed.

For the Director:

D. E. Henry,
Chief Constructing Engineer.

To all District Engineers,
Highway Engineer,
Acting Supervising Engineer,
Isabelo Lagniton,
S. Libby, and Designing Division.

DATA OF FAILING CONCRETE.

[Important: Submit one (1) form for each failing structure of which samples are sent.]

1. From ....
(Name of structure.) (Location.) (Province.)
Class of concrete .... Location of sample in
(As 1-2-4, etc.)
structure ....

	Give sources of information.	Verified from record "Yes" or "No."

2. Date of Construction ....
Engineer in charge of construction ....
Contractor..................................
Administration work (yes or no)..................................
3. Kind of water used (salt, brackish, fresh, well, running stream, etc.; clear, muddy, etc.) .... Has it been used successfully on other work? ....
List below (only jobs showing little or no deterioriation):

Name of job.	When built?	Exposure conditions.

Submit sample. (1 gallon in sealed container.)
4. Brand of cement used? .... Where obtained? .... Was cement tested?..........................
Where tested?..........................
5. Kind of sand used (river, beach, bank, etc., screened, washed, etc.) .... Has it been used successfully on other work? List below (only jobs showing little or no deterioration):

Name of job.	When built?	Exposure conditions.

Submit sample.
6. Kind of gravel used (river, beach, bank, etc., screened, washed, etc.) .... Has it been used successfully on other work? List bellow (only jobs showing little or no deterioration):

Name of job.	When built?	Exposure conditions.

	Give sources of information.	Verified from record "Yes" or "No."

Submit sample.
Verify all statements from your office records, if possible, *Indicate statements not so verified.* Answer every question, even if by "No information." Fill every blank.
7. Mixing (hand or machine) ....
Does concrete show thorough mixing? ....
Were ingredients thoroughly mixed, dry before adding water? .... Consistency of mixture ....
For hand-mixed concrete:
How many men used in mixing?..........................
Experienced or inexperienced..........................
Size of batches .... cubic meters.
For machine-mixed concrete:
Kind of machine .... size .... cubic meters.
How many turns of mixer { before adding water? .... after adding water? ....
8. Placing of concrete:
Spaded or rammed?..........................
Kind of instrument used? ....
Was water flushed to surface?..........................
Was concrete covered with water after being placed?..........................
9. How was concrete protected after being placed, and while seasoning:
Covered with ....
(Material.)
How long covered?..........................
Was it wetted down regularly?..........................
At what intervals?..........................
How long was wetting down continued? ....
What were weather conditions during placing and seasoning?
....
(Cloudy, bright, rain, etc.)

10. Conditions of exposure of failing concrete. In water? Salt or fresh? In water part of time only? Salt or fresh? Exposed to salt air? Distance from salt water? Distance from electric railway, lighting system, telephone system, etc. (Discuss this fully, adding such *facts* as you deem pertinent. Reserve statements of your opinion for paragraph 10.)
....
....
....

Verify all statements from your office records, if possible, *Indicate statements not so verified.* Answer every question, even if by "No information." Fill every blank.
11. Character and degree of failure. *This is of the utmost importance.*
....
....
....

Photographs showing character of failure. Number attached ....
12. What do you consider to be cause of failure?
....
....
....

13. Is steel rusting? .... (Submit samples of rust. Samples should be free from adhering concrete, and should consist of at least one (1) ounce.)
14. Anything you know regarding failure, not covered by the preceding?
....
....
....

15. Identification mark on packages containing samples..........................
Bill of lading number. ....
Ship samples to Director, Bureau of Science, Manila.
Mail data to Director of Public Works, Manila.
Verify all statements from your office records, if possible, *Indicate statements not so verified.* Answer every question, even if by "No information." Fill every blank.

APPENDIX B.

PROJECTS ACTIVE JANUARY 1, 1917.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.									
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric-light plants.	Miscellaneous.
Agusan	6	4			1															3											1		2
Albay	1	2								1			2									1											
Ambos Camarines	7	8		3	5					1			2						1	5	2	1	2		2	5							
Antique	5	2		2	2					1										1													1
Bataan	5	3	1																	1													1
Batangas	5	3			2	1				1		1	1					1	1	6	1		1		5	7		4				1	5
Benguet	16	9	2																						7	16	1	1	1				15
Bohol	4	3			3															1					1	3		3					8
Bukidnon	2	2							1																						1		1
Bulacan		3			1								1	1						1													
Cagayan	5	2			3	1							1							2	1					1	1						13
Capiz	3	2	3		6															2						1	1						1
Cavite	7	2			1															3													1
Cebu	5	2			2								4			1	1									3		2					6
Cotabato	8	2																		5					1	2		1				2	6
Davao	4	2							1																1	2					2		4
Ilocos Norte	3	2																		2		1	1										2
Ilocos Sur	8	7	1			2								1		1				2				1		5	3	1			2		10
Iloilo	11	2					1						2												1			1					5
Isabela	3	2			1								2							6						1							2
La Laguna	4	2			1			1												4		1				1		1			1		
Lanao	2	2		2		1																				3					1		2
La Union	4	4									1									6		1				1	2						2
Leyte	2	2																		2				1		1							1
Mindoro	5	3			1					1	1								1		1				1		1	2			1		2
Misamis	6	3		2	2								1							2				1		1		1					1
Mt. Province	7	10							1	6							2			2					1	7		1			4		8
Nueva Ecija	6	2																		4		1		1	2	1							1
Nueva Vizcaya	2	1		2																4		3	1										1
Occidental Negros	11	2		1	3		1						1					1						1		1	1						
Oriental Negros	5	4			2					1			1							2					2			2			1		1
Pampanga	6	4		1	1								1							1				2	1			1					1
Pangasinan	3	3		2	2															7						1		1					2
Rizal	2	3											1							1		1						1					1
Samar	4	2																		1					1	1	1						
Sorsogon	3	2																		2						4							1
Sulu	5	2															1			1				2	1	2		1			2		[illegible]
Surigao	5	2																		5		3				1							[illegible]
Tarlac	5	3			1																			1									
Tayabas	2	4			1															4						2							
Zambales	1	3			4															1						1							
Zamboanga	4	3		1	1															3					6	5		1			2		
Total	202	130	7	16	46	5	2	1	3	12	2	1	20	2		2	4	2	3	92	5	13	5	10	33	79	11	25	1		18	3	12

NOTE.—Of the 124 projects under the caption "Miscellaneous" ar e 9 surveys and investigations of roads, bridges, waterworks, etc wharves, 7 docks, 6 irrigation systems, 5 dikes, 3 port works maintenance, 2 dredging projects, 2 boundary monuments, 1 Custom Hous monument, etc.

BUREAU OF PUBLIC WORKS

◆

STAFF AND ENGINEERING PERSONNEL, 1916.

E. J. WESTERHOUSE, *Director of Public Works*
V. SEGURA, *Assistant Director*
R. H. DOANE, *Consulting Architect*
D. E. HENRY, *Chief Constructing Engineer*
C. E. GORDON, *Chief Designing Engineer*

Supervising Engineers
- H. F. Cameron
- R. V. Glenn
- J. L. Harrison
- F. T. James
- Claud Russell
- A. D. Williams

Highway Engineer
- W. C. West

Hydraulic Engineer
- G. G. Stroebe

Designing Engineers
- G. B. Canaga
- W. J. Grodske

Irrigation Engineer
- G. R. B. Symonds

Electrical and Mechanical Engineers
- W. A. Newton
- L. L. Vincent

Structural Engineer
- H. R. Kingsley

Chief Architectural Draftsman
- Cheri Mandelbaum

Architectural Draftsmen
- J. Altiveros
- C. A. Barretto
- A. S. Collins
- V. L. Legarda
- A. Toledo
- R. de la Rosa

Assistant to the Director
- C. A. Tansill

Superintendent of Artesian Wells
- Wm. Rader

Chief Accountant
- L. E. Williams

District Engineers
- R. Agcaoili
- R. N. Allen
- J. H. Ayres
- A. W. Austin
- S. Baluyut
- N. R. Baugh
- C. R. Bennett
- E. C. Brown
- L. R. Brown
- J. C. Carpenter
- J. H. Caton, 3d.
- L. T. Clark
- J. C. Cookingham
- C. S. Dandois
- V. Fragante
- Luis Francisco
- Pastor Gomez
- Leo J. Grove
- A. E. Haley
- W. B. Honska
- S. W. Hulse
- Leon Ines
- Marcial Kasilag
- H. B. Lilley
- S. Lopez
- J. T. Marshall
- Juan Macaraeg
- H. R. Meehleib
- Vicente Orosa
- C. E. Phipps
- E. E. Schenk
- R. H. Shoemaker
- A. H. Sjovall
- E. D. Smith
- L. E. Stevens
- A. T. Sylvester
- Antonio Tayzon
- A. G. Yankey

Property Clerk
- O. K. Oleson

Civil Engineers
- L. S. Boggess
- M. C. Collins
- E. C. Earle
- J. E. Hayes
- E. R. Hyde
- P. W. Mack
- A. Magsaysay
- H. V. Miles
- Jose Paez
- A. Richter
- Manuel Reyes
- Teofilo Reyes
- N. S. Saleeby
- Pedro Siochi
- Julian Vallarta

Assistant Civil Engineers
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DATA.

By W. C. WEST, Assoc. M. Am. Soc. C. E.

Data is obtained by asking for it, and to render his questions productive, the questioner must know what to ask for, where to go for his information, and how to put his questions. To know what to ask for, in the matter of engineering data, presupposes a knowledge of engineering design, complete as to principles and to some extent as to practice; to know where to go involves a knowledge of natural conditions, topographical, geological, social, and commercial; and to know how to ask for it can come only as the result of experience intelligently interpreted.

Engineering mistakes teach the importance of accuracy and adequacy in engineering data, and fortunate is the man who can visualize this importance without a life-size picture of his own blunder to go by. To former engineers of this Bureau who made mistakes, sometimes from over-confidence, perhaps, but much oftener from lack of data, we who come after owe a debt of gratitude. Every one of these mistakes was paid for, by the engineer who made it in loss of reputation and influence, and by the Government in the money that paid for the work. We have the record, and we use it. No sane man consciously repeats a blunder, but though he pour into that word "consciously" the sum-total of his learning and experience, there will yet be room for more. Not all the difficult situations of the present day have been catalogued in engineering literature by any means, and the new problems of the unfolding years are yet to be stated, let alone solved. It is inevitable, then, that mistakes will come, and that the generations will cry woe upon him by whom they come, hence the extreme advisability of walking circumspectly between the stakes set by those who have been over the line—and as far as those stakes extend. After that we must take our chances.

Just two things are expected of the engineer: To build correctly and to build economically. Whether his clients are bodies politic or corporations or individuals they want their money to buy them satisfaction, and just as much satisfaction as that money ought to buy. The designer of any engineering structure must visualize this satisfaction before he puts it on paper for the construction engineer to embody in wood and iron and stone; that is, he must know the character and magnitude of the service his structure is expected to render. This knowledge is engineering data. If he is to build correctly, he must be able to read the soul of the forces which will have the chance to put his work in jeopardy later,—data again. And if he is to build economically he must have knowledge of materials and machines and men as to availability, effectiveness, and cost,—data as well. Not one of these three classes of data can be dispensed with. If the engineer detailed to examine the foundations reports solid rock when his drill has merely struck an insignificant boulder, no amount of excellence in construction methods will ever make the building safe that rests on that foundation. The irrigation system predicated upon a flow of a thousand second-liters at the headworks, although the system may have been laid out upon the most perfect contour map that was ever made and by the Master of Hydraulics himself, loses much of its effectiveness when the flow drops to a hundred second-liters and insists upon staying there. And the construction engineer who spends money upon costly machinery without knowing that hand labor in that locality is cheaper, or who imports materials which former experiences have approved without taking cognizance of local resources that have the others backed off the map for cheapness and actual worth, will never merit promotion for his economical construction methods.

To impress the district engineer with the important position that the work of data-getting ought to occupy in his scheme of things, is frankly the object of this article. The prosaic and oftentimes apparently thankless and trivial character of the work is such as to diminish very greatly its chances of being seen full-size in the same perspective with a construction job costing a quarter of a million, for example. It takes imagination to vision clearly, imagination clarified and broadened by training and experience, imagination that goes far into the future beyond the driving of the last nail in the structure or the last turn of the steam-roller wheels, imagination that refuses to be limited by current year appropriations. No need to go into particulars here, for each province develops along lines more or less peculiar to itself. Data painstakingly gathered, intelligently correlated and safely filed, whether it be hydrographic, topographic, geological, or what, cannot but go a long way in helping the country to achieve economic independence; and the district engineer who sees this clearly and acts promptly and perseveringly on his vision,—he is the engineer whom the generations to come will be proud to honor.

THE SIBUL SPRINGS OF BULACAN.

By SOTERO BALUYOT, District Engineer.

In all countries and from the most remote ages the curative value of mineral water has been more or less known and appreciated by the people, but the popularity of medicinal waters has always depended more or less on their accessibility. In most cases mineral springs are found on or near the slopes of mountains, and hence the difficulties and hardships encountered in reaching them are often great. These are to a great extent eliminated by the construction of better highways.

There are numerous mineral springs in the Philippines, each of which has its own peculiar curative value. Among the most important and popular are the "Los Baños Hot Springs of Laguna," the "Marilao Well," and the Sibul Springs of Bulacan Province, all of which are widely known and much visited by pleasure seekers and invalids. Not only have these springs peculiar attractions for the people because of their valuable waters, but also because of the charms of their picturesque surroundings, which are bound to appeal to lovers of beautiful vistas.

It was in 1855 that Don Antonio Vazquez, a Spanish cavalry officer, operating with his famous horsemen in the neighborhood, discovered the mysterious Sibul Springs while in search of more commodious camping grounds. Sometime afterwards Don Joaquin de la Concha, father of the present owner of the Sibul Hotel, took possession of the place and consequently became owner.

In 1872 the Cavite Rebellion took place, and the Spaniards, having subdued the rebellion, took severe measures in the prosecution of all men suspected of taking part in it. It was at this time that Don Felipe Buencamino, Sr., suspected as being connected with the uprising, took flight to the mountains, hiding himself around Sibul

Springs. Through his efforts the insignificant outlets of the Springs were enlarged and improved.

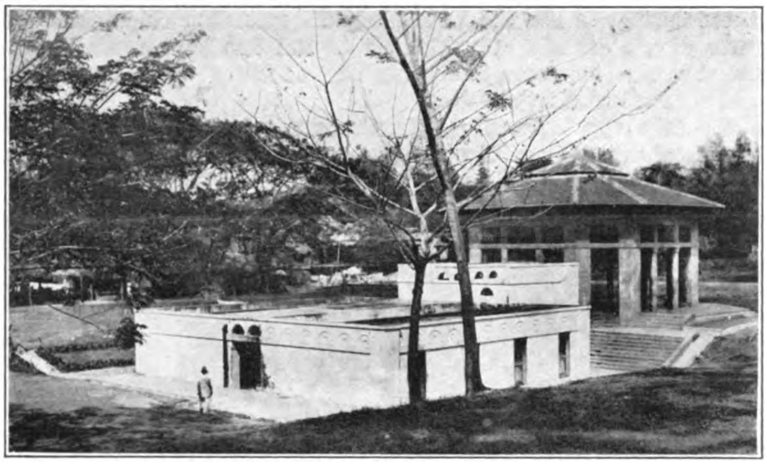
Up to the time when General Weyler became Governor-General of the Philippine Archipelago, little or nothing was known of the existence of mineral springs in Sibul, but during the general's incumbency as Governor his wife visited Sibul, remained about a year and was cured of some ailment from which she was suffering. Before this time, in 1876, a well-known priest by the name of Padre Francisco Ariola had been cured of indigestion or dyspepsia. The fame of Sibul Springs quickly spread throughout Manila and the nearby provinces, and the place came to be known by the name of "Miraculous Waters" or "Mysterious Springs."

It was said that afflicted persons had only to dip in the water to come out well, and hundreds of pilgrims went to the springs to make the experiment. The friars took control of the place, and built more comfortable dwellings near the springs. The houses were generally of nipa, but some of them were constructed of strong materials. They were enormous in size, but the white ants, or "anay," which still abound in the place, soon destroyed all the woodwork, leaving only the adobe foundations to mark their sites. People who desired to hear mass on Sundays, however, had to make journey back to San Miguel.

Bathhouse and pavilion, Sibul Springs, Bulacan.

Before the American régime there were no first-class roads, and but few steel and concrete bridges. Automobiles were unheard of. The difficulties of travel were very great and the services of a guide were of prime importance. Those desiring to bathe in the springs had either to ride on horseback or in a rustic carretela. Leaving San Miguel early in the morning the guide would lead them in a north-easterly direction toward Mount Corona, one of the highest peaks of the Cordillera range. The path wound among the hills, occasionally passing across deep fords, which contributed many a thrilling sensation. It was an ideal country for the Balugas, or aborigines, because of the abundance of game, such as wild chickens, deer, and the jabali or wild boar. The distance was 22 kilometers. The guide would show the tourist a hollow place filled with sulphurous water surging from small crevices in the limestone rocks on the slope of a low hill covered with tropical vegetation. That was the spring. A nipa hut stood near by, where visitors could make preparation for bathing in the mysterious waters. A few huts were scattered about near the springs where the tourist might rest, but in a short time the inhabitants of San Miguel began to settle in the place and to construct rude dwellings. These were more comfortable, however, than the huts built by their predecessors.

Conditions are greatly changed to-day. Instead of many days being consumed in the hard journey over narrow muddy roads, across numerous fords and on bamboo ferries, the trip is now one of three hours in an attractive and comfortable automobile, over first-class roads and steel and concrete bridges. Intelligible road signs at road crossings and kilometer posts along the road have taken the places of the guides formerly indispensable.



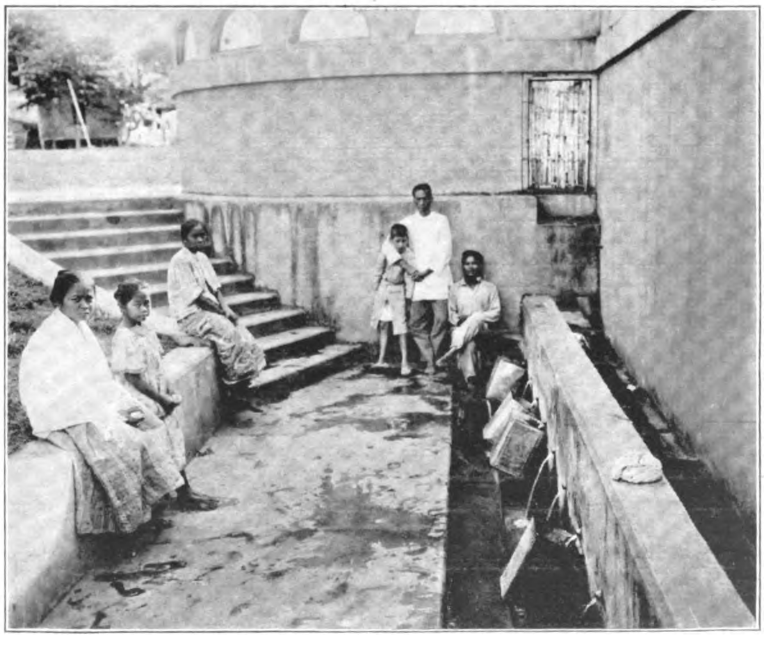
Bathhouse and pavilion, Sibul Springs, Bulacan.

The place no longer resembles the old Sibul with its rustic hut, but is really a modern health resort with a concrete pavilion containing ten sanitary baths, attracting bathers by their crystalline waters and multicolored tiles. The springs are surrounded by up-to-date commodious houses and hotels, well furnished and equipped.

Besides the good macadam road from Manila to Sibul, the trip can be made by railroad as far as San Miguel, and finished by means of a rubber-tired carromata or an automobile. The tourist traffic is very great, visitors coming not only from this province and Manila, but also from other provinces, as far north as Cagayan and as far south as Mindanao.

Tourists in search of pleasure or exercise can always find something of interest in the famous natural caves, such as the Madlum, the Renacimiento, the Cawali, the Germinal, and especially the historic cave of Biak-na-bato, where the peace compromise of 1896 between the Spaniards and the Filipino Revolutionists took place. These caves are from 3 to 9 kilometers distant from Sibul, and some of them are very cool and inviting for visitors who find themselves heated from long walks. Then there are the three mountains, Calavera, Infinito, and Calvario, whose tropical plants and heights allure those who wish a view of the surrounding country and the distant valleys and mountains, clad in the luxuriant vegetation characteristic of a climate of eternal sunshine.

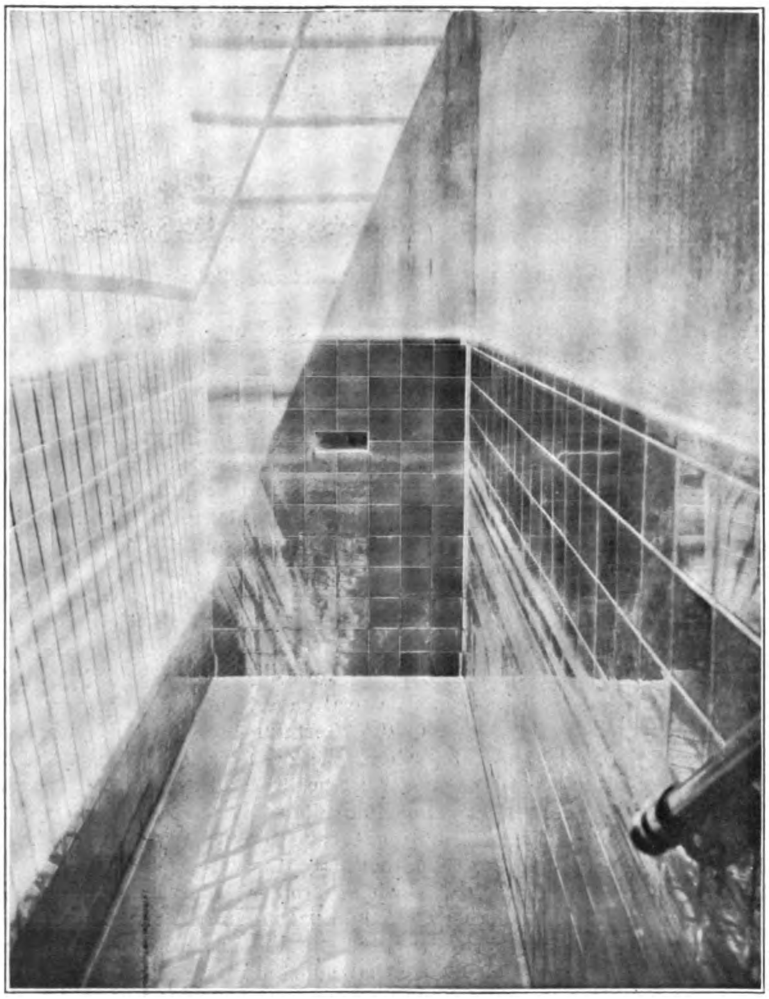
The opening of the first-class road made possible the exploitation



Drawing water for home consumption at Sibul Springs, Bulacan.

of the springs in the way of bottling the water for shipment to all parts of the Islands. Considerable capital has been profitably invested in the enterprise, to the manifest advantage of those who are unable to afford a trip to Sibul.

The following is the official chemical analysis and biological examination obtained from the water report on Sibul Springs of the Bureau of Science.



One of the tile-lined individual baths at Sibul Springs. Water enters at opening shown in rear.

Chemical Analysis.

(Results expressed as parts per million or as milligrams per liter.)

PHYSICAL CHARACTERISTICS.

MARCH 1, 1915.

Turbidity (as SiO_2)	nil	Normal carbonates (as CO_3)	nil
Alkalinity (as $CaOO_3$)	380.0	Bicarbonates (as $H—CO_3$)	463.6
Total solids	550.0	Sulphates (SO_4)	nil
Silica (SiO_2)	15.0	Nitrates (NO_3)	nil
Iron (Fe)	trace	Free ammonia	0.042
Calcium (Ca)	148.0	Albuminoid ammonia	0.026
Magnesium (Mg)	14.3	Total hardness (as $CaCO_3$)	438.0
Chlorides (Cl)	32.0		

[Remarks.—This water has odor of hydrogen sulphide.]

Biological Examination.

Colonies per cc. 24 hours, 60.
Flagellates, negative.
Remark, amoebae, ciliates, negative.
Presumptive test, negative.
Attempt to isolate B. coli, negative.

[General remarks.—A biological examination at the source showed a 24-hour colony count of 8.]

Below are the statements of the Director of Science regarding Sibul Springs:

> These springs are bacteriologically very pure.
>
> In recent years the hydrogen sulphide content of this water seems to have decreased markedly. The springs are non thermal. The water is calcic, bicarbonated, sulphurated, but it is so low in dissolved solids, that it can hardly be classified as "mineral" on the basis of its salt content. Though some of the dissolved salts might have medicinal value, it is highly doubtful whether any of them are present in sufficient quantity to have marked therapeutic effect. It is clear, therefore, that any therapeutic value these springs may have can scarcely be attributed to its salt content.
>
> Very recently a series of determinations on radio activity[1] has shown that Sibul Springs are radio active. Their activity is due chiefly to radium emanation content, radium itself being present only as a mere trace. In view of the present unsettled state of radium therapy, especially as applied to radio active waters, this Bureau does not care to make definite assertions concerning the medicinal effect of the radio activity of the Sibul Springs.
>
> It appears plausible, that the therapeutic value, if any, possessed by Sibul Springs is due, not to the dissolved mineral salt content, but rather to the fact that the water is free from micro-organisms and deleterious substances, and, perhaps, to the radio activity of the water.
>
> It must be emphasized, however, that any beneficial effect due to radio activity can be secured only by using the water directly at the source; for not only is the radio activity removed from the water by slight shaking and aeration, but is also rapidly decays spontaneously. It is clear, therefore, that bottled Sibul Spring water, or water carried for any distance, can have no medicinal virtues due to radio activity. * * *

BOAC RIVER CONTROL.

By A. T. SYLVESTER, District Engineer, Tayabas Province.

At Boac, Marinduque, the flood-plain of the river bearing that name is about 1 kilometer wide. Unfortunately, the tendency of the current is to work toward the town and the southern bank, and studies made during the past ten years show steady encroachment upon, and destruction of, the exposed business section of the town.

In 1916, the people of Boac, through Lieut. Gov. Juan Nieva, of the subprovince, and Representative Gregorio Nieva, of the Legislature, again took up the matter of preventing further encroachment by the river, with the result that an appropriation of ₱15,000 was secured and plans prepared for the work.

It was evident that an attempt to prevent flooding of the lower town at high water stages would not only be exhorbitantly costly, but would involve control of all the run-off from the hilly country lying back of the town. The plans, therefore, contemplated only temporary works to prevent further scour. The wooden-pile hurdle, used so extensively on the Mississippi river and its branches, was selected as the most suitable type for the purpose and authority was granted for immediate construction, by administration, in view of the proximity of the flood season.

A pile driver, less engine and boiler, was rented from the Province of Bataan. The Bureau also arranged the rental of a hoisting engine and boiler from the Manila Railroad Company. Wire and hemp rope, blocks, tools, etc., were furnished from stock, or purchased. A supply of piles was available at Manila. An experienced hoisting engineer, a pile-driver capataz and helper were secured by the Bureau and nothing remained but to ship the outfit to the job and do the work.

The Bureau of Customs had just put the Steamship *Johanne* in commission, and were looking for a cargo. On July 20th the Bureau of Public Works wired that the *Johanne* would bring the driver and engine, together with 134 piles, ranging from 8 to 18 inches in diameter and 33 to 48 feet in length. Included in the shipment were 61 pieces of 4 by 12 inch yacal waling, 14 feet long.

Boac has two ports. Both are about 3 kilometers from the town. All unloading is done with small boats, bancas, etc. When it is too rough at Laylay, they unload at Bullasnin, which is on the other side of the low point. Ironwood piles and yacal lumber will not float unassisted, and engine and boilers cannot be transported in small boats, or bancas. A bamboo raft was constructed for the heavy equipment and boats and bancas collected for the lighter work.

At 10 a. m., August 1, the *Johanne* dropped anchor at Laylay, with a rough sea running from the south. After about an hour's stiff work, the assistant engineer was able to board the ship. The captain

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[1] Wright, J. R., and Heise, G. W., Philippine Journal of Science. Sec. A. (1917) 12.

Looking down Boac River showing completed hurdles, subprovince of Marinduque.

Hurdle Nos. 2 and 3, Boac River, subprovince of Marinduque.

saw the impossibility of unloading at Laylay, and at once steamed to Bullasnin, where the ship anchored about one-half kilometer from shore. Unloading began at 2 p. m. Piles had to be lashed to boats and bancas, the small boats taking six and the large boats ten or twelve piles. A ship's line to the shore aided materially in handling the balsa.

The length of the piles rendered them awkward to handle through the ship's hatches and twenty laborers had to be supplied to help out the ship's crew on deck. Unloading continued up to 2 a. m., August 2. After a rest of four hours, work was resumed and was completed at 2 p. m. The boiler and engine had been shipped set up. By lashing a boat to each side of the balsa, sufficient buoyancy was obtained to float the engine and boiler to shore, where they were dismantled. The pile-driver frame floated and presented no difficulty. The hammer was transported on the balsa.

Bullasnin is connected to Boac by about 3 kilometers of second and third class road. The majority of the distance is merely a cart path through cocoanut groves. The pile driver, engine parts, and boiler and 4 by 12 inch waling were transported to Boac, by bull cart, at ₱1 per trip. The piles were classified according to size, as first, second, and third class. The hauling of the first-class piles, which were smallest, was let to individuals at ₱1 each. The intermediate size cost ₱1.50 each, and the third class, or largest ones, cost ₱2 each. Some piles were hauled on carts and others were dragged by carabaos. Loading and unloading of cart was by day labor.

On August 6 the engineer began to set up the engine and driver. He found the steam gauge broken, all pet cocks missing, the safety valve missing, the blow-off valve leaking badly and no oiler for the cylinders. The steam packing was all practically useless and the babbit of the drum bearings badly worn. Eleven days work, during which time repairs to the engine and boiler were made, found the equipment ready for work, and on August 17, No. 1 pile of the first hurdle was driven, in the presence of the local officials, a band of music, and of everyone who could get there in time to witness the event.

The engine and pile-driver force employed were as follows:

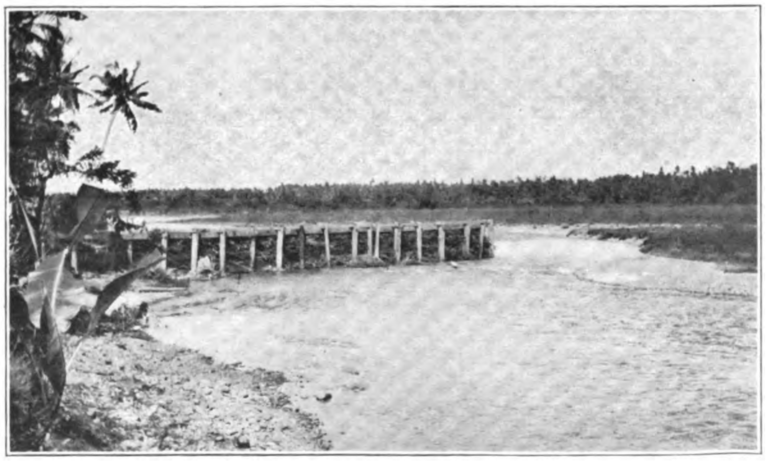
Engine force—
- 1 hoisting engineer, at ₱75 per month.
- 1 fireman, at ₱1.50 per day.
- 2 laborers (for water and fuel), at ₱0.60 per day.
- 1 laborer (at the drums and cables), at ₱1 per day.

Pile driver force—
- 1 pile-driver capataz, at ₱2.40 per day.
- 1 head carpenter, at ₱2.40 per day.
- 4 carpenters, at ₱1.50 per day each.
- 1 carpenter, at ₱1.40 per day.
- 2 carpenters, at ₱1.25 per day each.
- 11 laborers, at ₱0.80 per day each.

Burning wood as fuel, and with the equipment and crew stated, the pile driving for the first (upstream) hurdle was completed, on August 30, in ten working days. Fifty-three piles were driven; average length, 30 feet; average penetration, 22 feet. Cocoanut logs, delivered uncut at ₱0.50 each, cut at ₱1 each, were used as caps, secured by drift pins made of short lengths of old twisted reinforcing steel. The chimney screen could not prevent showers of sparks when wood was used as fuel, and the municipal officials kept a police guard, with fire hose, buckets, etc., on duty when driving was in progress, as many of the houses in the immediate vicinity of the work have thatched roofs.

Three days were required to move the pile driver to the site of the second hurdle and on September 3, pile driving was again started. The 4 by 12 inch waling planks were installed as fast as the piles were driven, and old form lumber furnished temporary bracing. The caps and drifts bolts from the first hurdle were used on the other two hurdles. Pile driving and waling on No. 2 hurdle were completed

Hurdle No. 1, Boac River, subprovince of Marinduque.



Hurdle No. 3, Boac River, subprovince of Marinduque.

September 10, in 7 working days, at the rate of 6 piles per day. Average length of pile was 34 feet; average penetration 24 feet.

Pile driving was started September 13 on hurdle No. 3 and was completed September 20. Average length of piles, 31 feet; average penetration, 20 feet. Hard rains slowed up the work on the last hurdle, and the best of the piles having been used for the first two hurdles, much splitting occurred, necessitating much replacement during the last stages of the driving.

The minimum penetration secured in the three hurdles was 15 feet and the maximum, 26 feet. Short pile-driver leads prevented the use of the entire length of the long piles.

The space between the two lines of piles in each hurdle has been filled with brush and bamboo, and, while the slight floods which have thus far occurred indicate that the hurdles will prove to be entirely adequate protection against scour, only a big flood can demonstrate whether the hurdles will stand punishment, and force the river to seek a new channel further from the town. (See Tayabas project notes which were written after this article was submitted.)

As will be noted in the following cost data, the work was expensive, yet not unduly so considering all conditions.

Cost data.

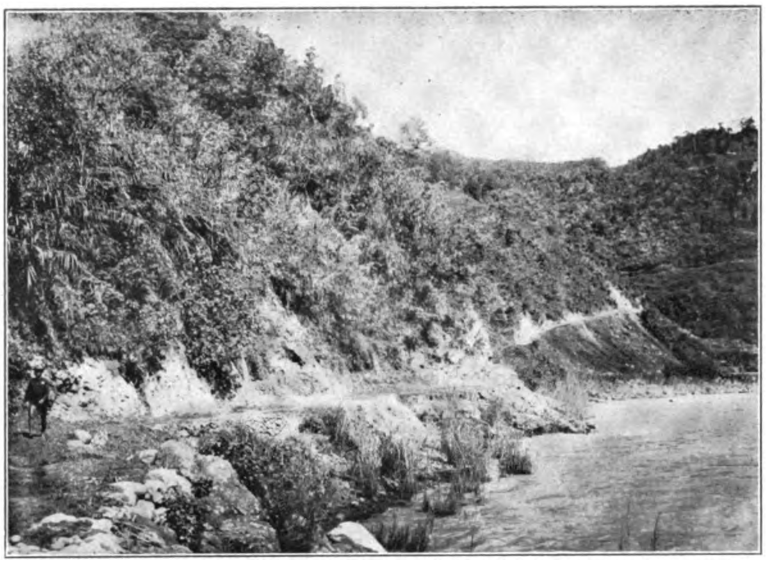
Appropriation		₱15,000.00
Expenditures, Miscellaneous:		
Steamship transportation	₱2,275.00	
Local transportation	593.25	
Rental of equipment	540.00	
Other expenditures	13.29	
Labor	2,807.25	
Materials:		
Piles	1,785.30	
Bureau supply and local	2,035.02	
Surcharges	791.57	
Liabilities:		
Steamship transportation (estimated)	200.00	
Surcharges	44.00	
		11,084.68
Balance		3,915.32

Mr. Dalmacio Urtula, assistant engineer, was in charge of actual unloading and construction operations, and successfully handled a difficult piece of work. The obtaining and shipment of materials and equipment promptly was accomplished by the Bureau personnel at Manila. Unloading at Bullasnin and the work of actual construction was materially aided by local officials and private citizens.

DEVELOPMENT OF PUBLIC WORKS IN THE MOUNTAIN PROVINCE.

R. H. SHOEMAKER, District Engineer, and A. D. WILLIAMS, Supervising Engineer.

The development of public works in the territory now included in Mountain Province, which embraces the subprovinces of Amburayan, Apayao, Benguet, Bontoc, Ifugao, Kalinga, and Lepanto, may be said to date from the American occupation of the Philippine Islands. But few public works assets were left by the Spanish administration, about the only evidence of activities in this direction being a few kilometers of cart road, the government buildings in the towns of Tagudin and Cervantes, and some foot trails, that were passable with difficulty for a horse, connecting what were known as *Comandancias*. The first work undertaken after American occupation was accomplished by the Military Government, and consisted principally in constructing horse trails and improving old foot trails. With the organization of the Civil Government, lieutenant-governors were appointed for the different subprovinces and were placed in charge of public works in addition to their other duties, reporting directly to the Secretary of the Interior. Act No. 1876 of the Philippine Commission, passed in 1908, organized the different subprovinces as Mountain Province with the capital at Bontoc, and authorized the employment of a supervisor who was to have his office at the capital and was to supervise all public works in the province, reporting to the Secretary of the Interior through the governor of the province. The position of supervisor was usually filled by an engineer or by a man with practical experience, but due to the extensive territory to be covered and the labor conditions obtaining in the province the lieutenant-governors remained in direct charge of public works and the supervisor acted largely in an advisory capacity.



Kiangan-Banaue trail, Mountain Province.

The Appropriation Act for Mountain Province for 1916 placed the supervision of public works under the Secretary of Commerce and Police and the territory was divided by the Bureau of Public Works into what is known as Mountain Province District, comprising the subprovinces of Amburayan, Apayao, Bontoc, Ifugao, Kalinga, and Lepanto, and the Benguet District embracing the territory included in the subprovince of Benguet. District engineers were appointed effective April 1, 1916, with headquarters at Bontoc and Baguio, respectively. Prior to this date only special projects in the subprovince of Benguet, including the maintenance of the Benguet Road, construction and maintenance of the Naguilian Road, public works in the city of Baguio, and construction of a section of the Manila–North Road in Amburayan had been placed under the supervision of the Bureau of Public Works.

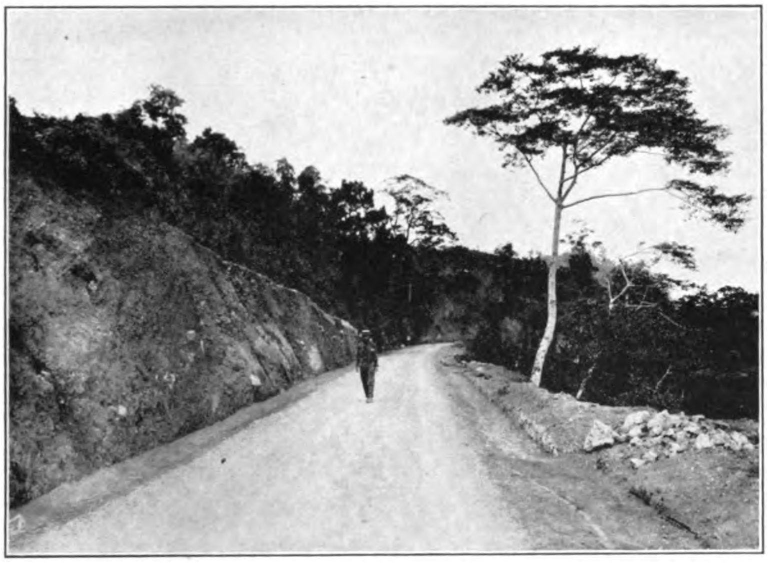
Data relative to the early execution of public works in Mountain Province are very deficient due to changes that have been made in the methods of accounting in the treasurer's office, incomplete reports in the supervisor's office, and the fact that no record was kept of road tax and voluntary employed prior to 1911. The following figures showing expenditures since 1910 for public works under the supervision of the Supervisor are approximate only:

	1910	1911	1912	1913	1914	1915	1916
	Pesos.	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*	*Pesos.*
Appropriation	472,611.24	206,114.20	233,320.48	212,949.15	148,944.62	208,729.84	278,297.73
Road-tax labor	----------	8,838.00	64,732.00	59,682.00	53,464.00	62,000.00	60,000.00
Total	472,611.24	214,952,20	298,052.48	272,631.15	202,408.62	270,729.84	338,297.73

Considering the large territory over which this money has had to be distributed, the physical features of the country, transportation dificulties, and adverse labor conditions, the public works assets give a very creditable showing. During the early days of the American occupation, the great interior of the province was considered practically inaccessible and the non-Christian inhabitants little better than savages, and the fact that it is now possible to travel over improved horse trails connecting all the subprovincial capitals with the capital at Bontoc and with adjoining provinces, does not begin to show the development that has taken place in public works. There were probably over 95 per cent of the Igorot or non-Christian people (estimated population 300,000) who had to be taught the value of traffic routes and the necessity for public buildings, not to mention the fact that they had never seen a pick or shovel, hence it will be easy to understand that labor was apparently scarce until about 1910 and that it is now more abundant than in any other locality in the Philippines. Until the completion in 1910 of the trail leading from the coast at Tagudin to Bontoc, a distance of 128 kilometers, all supplies needed in construction work or otherwise had to be packed on cargadores, but with the completion of this trail the pack pony appeared, and by 1915 the trail had been widened to such an extent that it was passable for narrow tread bull carts. This class of transportation for supplies can now be used not only to Bontoc but for the subprovinces of Ifugao and Kalinga at distances of over 200 kilometers from Tagudin. The high cost of transportation, however, making the value of a barrel of cement about ₱25 when issued at Bontoc, is still a great handicap in public works and necessitates special plans and the utilization of the materials readily at hand.

ROAD AND TRAILS.

The mountainous character of the country, together with its unstable geological formation and its rivers subject to enormous floods, has presented unusual problems in road and trail location, construction and maintenance, and these in the face of limited funds, labor troubles and high costs of supplies. In many cases the necessity for low initial costs has made it necessary to avoid heavy rock work to the disadvantage of the location, and in general the existing roads and trails have been built without making surveys or giving due consideration to the character of the country or to alternate locations. As a result many changes have had to be made in improving horse trails for cart traffic and others will be required in converting the cart trails into roads. Locations as a rule have been staked out with a hand level without allowances for sharp turns, thus making it difficult to reduce curvature without employing heavier grades. Also, owing to the practice of carrying on location and construction at the same time, side hill "zigzags" or "switchbacks" are too frequently features of most of the roads and trails already constructed.



Kilometer 7, Baguio-Naguilian Road, Benguet, Mountain Province.

The roads and trails in the Mountain Province have been classified as follows:

	Kilometers.
First-class roads	102.6
Second-class roads	37.6
Third-class roads	322.9
Improved trails	1,040.7

In addition to these roads and trails there are over 600 kilometers of trails which might be classed as unimproved and which are not regularly maintained but are passable for saddle or pack horses during the dry season. These trails usually follow old foot paths that have been somewhat improved by widening.

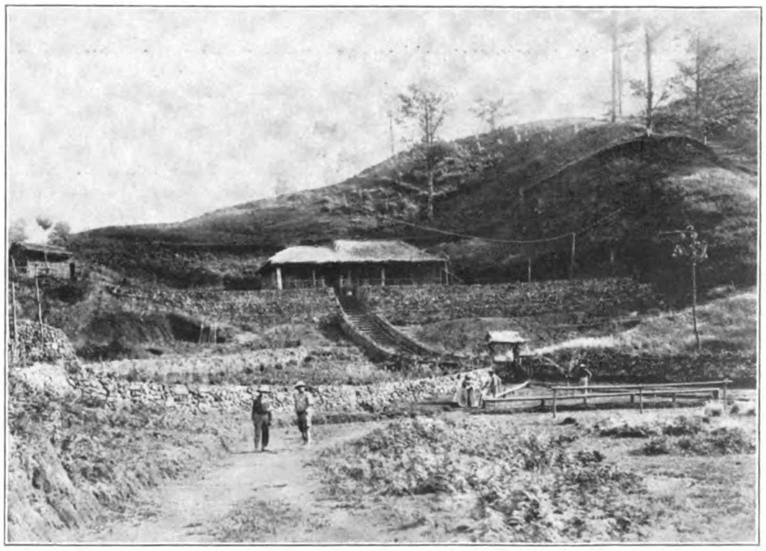
The first-class roads in the province, excluding the roads in the city of Baguio, are the Benguet and Naguilian Roads and a section of the Manila–North Road in the subprovince of Amburayan. The second and third class roads are old Spanish roads in the subprovince of Amburayan and the Trinidad Road leading from Baguio to Trinidad, the capital of Benguet.

The trails designated cart trails included under third-class roads are those which are passable for either standard or narrow tread carts and have an average width of about 2 meters. Cart trails have usually been constructed on gradients not exceeding 10 per cent, except at stream crossings, and 7 per cent grades are the usual practice. Drainage openings are not provided except in the case of large or deep drainage courses where it would not be practicable to construct rock or masonry spillways. The trail bed is graded on hillsides with a slight slope toward the outside bank, which allows surface water to pass over the trail, thus causing a minimum amount of erosion. There are a number of rubble masonry culverts in the towns of Bontoc and Cervantes but no permanent bridges have yet been constructed. The timber bridges on cart trails are on rubble masonry abutments or on natural rock, and are constructed of hand-sawed or hewn pine lumber. The maximum load that these bridges have to carry is about two tons and a variety of designs has been followed in construction. The types that are usually in evidence are the king post, queen post, pony, and triangular Howe trusses, and suspension bridges. Where timber can be cut near the site the construction can be carried out in a very economical manner without the necessity of employing much skilled labor. The life of this timber, however, is only from two to four years, which necessitates frequent repair work on the bridges.

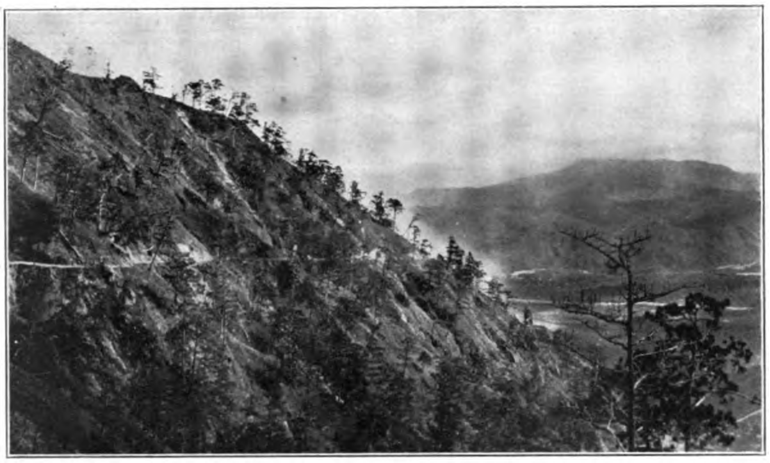
Kilometer 56, Cervantes-Bontoc trail, Mountain Province.

The most important cart trail in the province is the one leading from the coast at Tagudin through Cervantes to Bontoc, distant 128 kilometers from Tagudin. Practically all of the freight transported to and from the interior of the province is hauled over this trail in narrow tread carts. Approximately 100,000 kilos of freight per year is hauled in this manner for the provincial government, and a low estimate of the average daily traffic would be 30 carts, not including the heavy foot traffic.

The trail is very well constructed as a cart trail, and has been



Loo resthouse, Benguet.



Cervantes trail, Mountain Province.

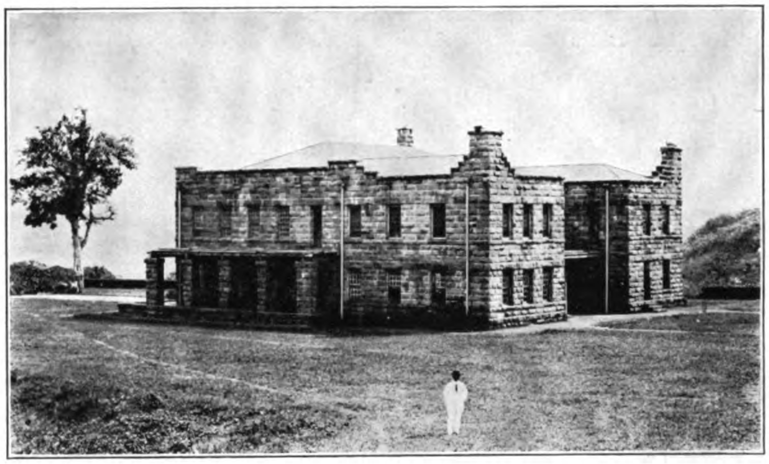
so improved during the past two years that it is now passable for small touring cars during the dry season all the way from Tagudin to Cervantes. The necessity for converting this trail into a road for heavier traffic and for extending it into the Cagayan Valley is becoming more and more insistent, and the improvements are now being made with this in view. Expenditures on construction and maintenance up to June 30, 1915, totalled approximately ₱400,000 in cash and ₱56,000 in road-tax labor. Compared with the cost of other trail work in the province these figures are considered high, but this is due principally to the fact that several sections of this trail were located, like the Benguet Road, below high water and as a result have had to be rebuilt several times at heavy expense. An insular allotment of ₱86,000 was made available in 1917 and work is now in progress, the old location being followed except for one section of about 2 kilometers. Numerous heavy grades and dangerous curves have been eliminated, and a number of structures. The final plans call for a 250-foot suspension bridge at Uradaan and one of 150-foot span at Butac, and a low-water bridge at Cervantes. For scenic effects, the road when completed will combine the canyons of the Benguet Road with the mountain vistas of the Naguilian. The cart trail between Bontoc and Lubuagan, completed in 1916, would be utilized in constructing this road from the west coast into the Cagayan Valley, and investigations are being made with such an object in view, work to be commenced as soon as funds can be provided.

The trail second in importance in the construction of a road system for the Mountain Province would be the one from Bontoc to Nueva Vizcaya through the towns of Banaue and Kiangan, subprovince of Ifugao. This trail has been improved to make it passable for bull carts throughout the entire distance of 116 kilometers. The route offers an outlet for the people of the crowded subprovinces of Bontoc and Ifugao to the provinces of Nueva Vizcaya and Isabela, where large tracts of agricultural land are available for homesteaders, and also facilitates the purchasing of rice for Ifugao and Bontoc, which provinces do not produce enough for their own consumption.

Central School at Cervantes, Mountain Province. Brick made locally.

The trail third in importance is the one proposed from the west coast in Ilocos Sur Province crossing the province of Abra and the subprovince of Kalinga to Cagayan Province. The section across Kalinga was practically completed as a horse trail during 1916 and a portion of the trail in Abra has since been constructed. This trail when completed will facilitate the marketing of cattle and crops grown in Abra and Kalinga, and offers a better travel route for the people from the densely populated sections of the Ilocos provinces to emigrate to the Cagayan Valley.

The thousand kilometers of trails in the Mountain Province which have been classified as improved horse trails have been well constructed as such, and when the necessity arises for converting them into cart trails or roads for heavier traffic the work that has been done can be utilized to a considerable extent. In the case of many trails the necessity for this improvement will not be apparent in the near future, but at the same time the development of the province is directly dependent on road and trail work and will keep pace with it. The most important and difficult trail to maintain is the one known as the Mountain Trail from Baguio to Bontoc, a distance of 175 kilometers. This trail has an average width of 1½ meters, and with the improvements that have been made upon it since construction, is now well located. Regularly organized gangs are employed in its maintenance and for widening and other improvement work. Maintenance work is put on most of the other horse trails intermittently. A trail inspector is usually employed for a section about 30 kilometers long, and he is required to make frequent inspections as well as to secure road-tax labor for maintaining the trail whenever repair work is necessary.



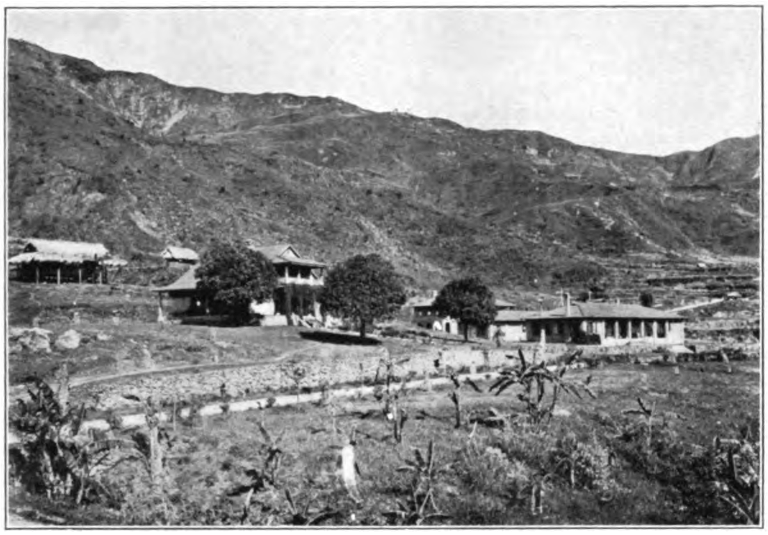
Kiangan provincial building, Mountain Province. Stone cut and building constructed by local labor.

BUILDING.

In building construction a large number of projects have been completed in a very economical and creditable manner. All of the public buildings that have been erected in Bontoc, the capital, including the provincial building, jail, hospital, market, Constabulary barracks, school buildings and six buildings used as quarters for employees, are built of brick with galvanized-iron roofing. The brick was all manufactured in the town of Bontoc at a very small cost and is of fair quality. A brick school building has also been erected in Cervantes with brick manufactured at the site. In Kiangan is a beautiful cut-stone building erected largely by Ifugao schoolboys under the supervision of an American foreman. Light materials have been used largely in the construction of provincial school buildings, Constabulary quarters and other public buildings elsewhere in the province, for the use of cement in the interior of the province for building construction is prohibitive on account of the high cost of transportation. Lime rock suitable for making lime has been found as a rule where masonry work has been undertaken, and a lime mortar is used in the work except in the case of floors which are usually finished with two inches of concrete. The lumber used in building construction—usually pine—is hand-sawed, except for building work in Bontoc and Cervantes, where lumber can be purchased from a sawmill operated by the Sagada mission.

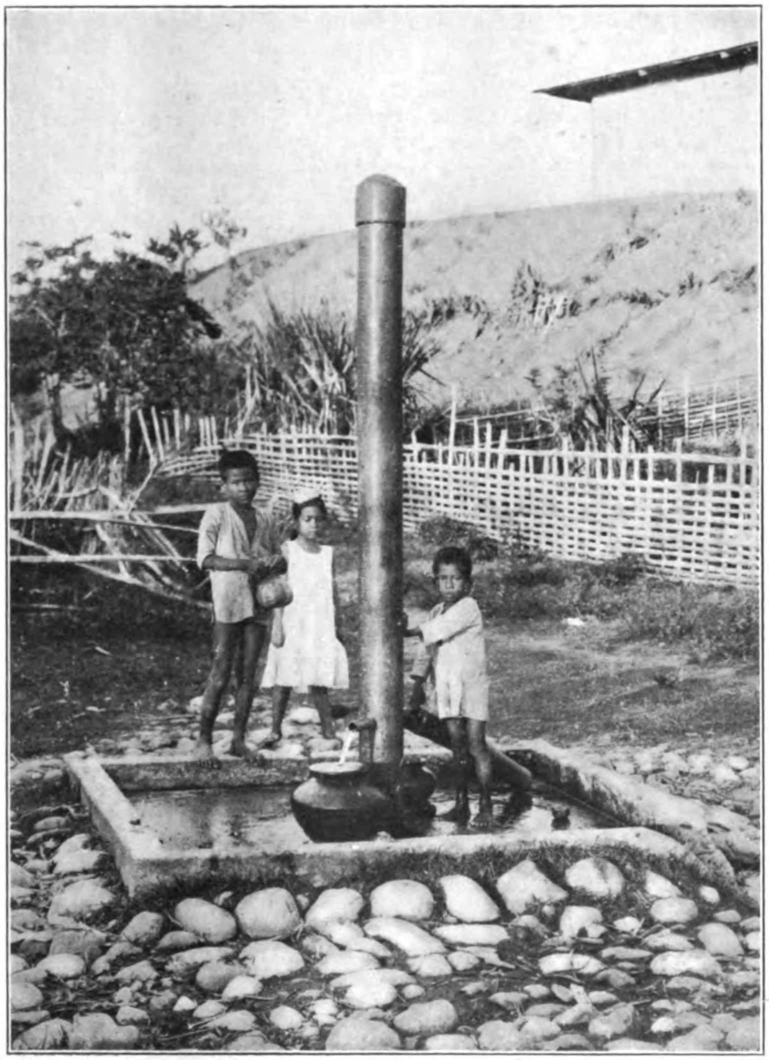
MISCELLANEOUS.

Besides the trail, road and building work that has been accomplished, water supply systems have been installed in all of the subprovincial capitals except Kabugao, over 500 kilometers of telephone lines have been erected, a river wall has been built at Tagudin, resthouses, about 30 kilometers apart, are to be found on important trails, and several modern irrigation systems are now in successful operation. The water-supply systems are all of the gravity type, and furnish water to the inhabitants of the different towns both for drinking and sanitary purposes and for fire protection to public buildings. The telephone lines, making it possible to communicate with all the subprovincial capitals and other important towns from Bontoc, has contributed a great deal toward the development of the province. The maintenance of resthouses on all the important trails makes traveling in the Mountain Province as comfortable as will be found in mountainous regions anywhere. Irrigation work in the Mountain District, excepting one government project constructed in Bontoc, has consisted principally in assisting the natives in extending their private systems, for practically all the land used for growing rice is under irrigation. The native Igorot and especially the inhabitants of the subprovince of Ifugao have demonstrated wonderful ability in terracing the steep hillsides and in constructing irrigation ditches to supply these hillside farms. Probably the most interesting and picturesque sight in the Mountain Province is made up of these terraced farms and the remarkably good crops that are grown upon them.



Nurses' dormitory and hospital at Bontoc, Mountain Province.

Brick made locally.



Artesian well at Tagudin, subprovince of Amburayan.

HEALTH VALUE OF ARTESIAN WELLS.

By Victor Alfonso, Formerly Provincial Treasurer of Nueva Ecija.

Much has been said and written about good roads and reinforced concrete bridges as modern elements in the development of our agriculture, commerce and industry; but very little has yet been mentioned about the great health value treasured up in every artesian well constructed in a community. Although the construction of artesian wells is one of the known activities of the Bureau of Public Works and one that the Philippine Legislature annually sets aside several thousand pesos to defray two-thirds of the expenses thereof, yet, save some official reports concerning same, it is regretted to note that there exist at present no systematic campaign to impress upon the general public the necessity of furthering this project and to encourage our municipalities and private individuals to do their utmost to coöperate with the Government and to deal with this problem as a matter affecting their own interest.

Long before the sanitary commissions have gone to some municipalities to study the cause of the diseases prevalent therein and recommend the remedy therefor, the statistics of deaths from cholera, smallpox, disentery, and other intestinal troubles which occurred in a municipality previous to the construction of an artesian well as compared with those registered after a pure water supply has been obtained, have already furnished us with the eloquent fact that the artesian well is called to occupy the first place in the public sanitation of the Philippine Islands. In fact, the result of the work rendered by said sanitary commissions and the recent demography reports have done nothing but strengthen the above contention. We therefore admit that the construction of artesian wells becomes one of the necessary means in carrying out the modern hygienization of our country and it is the most advanced agent to prevent infant mortality. There must be no further delay for our municipalities to appropriate money every year to meet one-third of the expenses of the construction of artesian wells, or in default of municipal funds a compaign of publicity should be resorted to, to interest the people to undertake a public contribution, promoting among them the same spirit and enthusiasm as when they are trying to open a public dispensary by public contribution, or when they are going to establish an agricultural coöperative assciation, etc. Of course, our insular and provincial officials are doing their best to promote the construction of artesian wells wherever possible, but there seems to remain much to be done in order to interest the general public so they will respond with their share of this modern and greatest utility which we may consider the corner stone of every sanitary measure either to prevent the diseases or to stamp out any epidemic already invading a community.

THE MICHELIN ROAD MAINTENANCE PRIZE COMPETITION FOR 1917

The following is the result of the Michelin Road Maintenance Prize Competition awarded by the Committee, Mr. W. C. West, chairman, Mr. Theobald Diehl, member and Mr. Romarico Agcaoili, member. One hundred pesos was given to each Capataz and fifty pesos to each Caminero.

Capataces.

Name.	Province.	Section.	Kms.
Juan Arsibal	Ilocos Sur	Sinait-North Bdry	29-39
Adcodato Guerrero	Ilocos Norte	Currimao-South	30-46
Agustin Galang	Bulacan	Pulilan-Calumpit	45-58
Mariano Villanueva	Rizal	Manila-North	8-14
Buenaventura Torres	Batangas	Tanauan-Lipa	78-88

Camineros.

Name.	Province.	Section.	Kms.
Angelo Mendoza	Ilocos Sur	Cabugao-Sinait	34
Bonifacio Guernade	Ilocos Norte	Currimao-South Bdry	32
Balbino Marcos	Bulacan	Pulilan-Calumpit	47-48
Lino Almaden	Cebu	Cebu-North	30
Paulo Locsing	Iloilo	Iloilo-South	19
Felipe Castillejos	Cebu	Cebu-South	25
Alejo Murao	Pangasinan	Pao-Bobonan	236
Pedro Pasco	Batangas	Tanauan-Lipa	82
Ambrosio Lasatin	Tarlac	Prov'l Ground	132-133
Florentino Lagunday	Antique	San Jose-North	12-13

Capataz Mariano Noval of the Cebu–North Road, province of Cebu, obtained a rating of 96 per cent but owing to his leaving the service several months ago, the prize was therefore awarded to Buenaventura Torres, Batangas, Capataz.

ON THE JOB HERE AND THERE.

The following ex-Bureau employees are on active duty in the military service of the United States. The list is complete as far as known. The Bureau will greatly appreciate information concerning any others, who should be on the Bureau's Honor Roll. There is a place for a star on the Bureau's service flag for every Bureau man who has enlisted in the country's service: Warwick Greene, O. D. Filley, H. F. Cameron, S. L. McGlathery, J. K. Pickering, Clay Anderson, D. Q . McComb, H. R. Kingsley, E. R. Hyde, J. H. Caton, 3d, A. H. Sjovall, G. K. Larrison, J. I. Quinn, O. N. Powell, G. G. Ball, F. D. Nash, D. L. Haseltine, and J. A. Beemer.

J. C. Carpenter is now U. S. highway engineer in charge of all road work under federal control in the State of North Carolina. It is expected to expend $5,000,000 within the next five years.

O. D. Filley, at one time supervising engineer in this Bureau, is now a lieutenant-colonel in the Aviation Corps, having been transferred from the Royal Flying Corps of the British Army which he joined early in the war.

PROJECT NOTES FROM DISTRICT ENGINEERS.

ALBAY.—Complete reconstruction of the first 13 kilometers of the Guinobatan–Jovellar Road will have to be done early in 1918. The limestone surfacing used has failed under truck and heavy cart traffic. The remaining unfinished 3 kilometers of this road will be completed, it is expected, during the first quarter of 1918. The whole road will be surfaced with Camalig stone.

Resurfacing is in progress on the Agus river section of the interprovincial road from kilometer 47 to kilometer 51. Kilometer 48 is practically completed.

Resurfacing materials from Camalig are being prepared for the repair of the Legaspi–Daraga section of the Legaspi–Agus Road. This section was resurfaced with 5 centimeters of Albay stone in November, 1916, but the heavy truck traffic has caused it to fail in a year's service. The resurfacing of kilometers 9, 10, and 11 of the same road has been completed.

Resurfacing also has been completed in kilometers 10, 11, 12, 13, and 14 on the Legaspi–Tiwi Road, and resurfacing materials are being prepared on the Tabaco–Wharf Road.

Surfacing materials are being delivered on the Legaspi–Daraga via Gogon road construction. The construction of this road was authorized by the provincial board to relieve the congestion of traffic on the Legaspi–Daraga via Albay Road.

Work will be started on the Virac–Calolbon Road, subprovince of Catanduanes, as soon as the rainy weather is over, which will be about February.

The provincial board has approved the collection of tolls on all first-class roads, effective January 1, 1918, to cover the deficit in the budget for the fiscal year ending December 31, 1918.

Nonresident Government employees of the Insular and Provincial Government have begun to take up quarters in Regan Barracks which was abandoned by the U. S. Army last October. Seven officers' quarters have been assigned to them at a moderate monthly rent, and many more are expected to be taken early in the coming year. One barrack building has been assigned permanently to a company of the Philippine National Guard.

AMBOS CAMARINES.—During the past quarter, 2 successful artesian wells have been drilled in Nabua. One flows 10 gallons per minute, 3 feet above the surface, and the other flows 5 gallons per minute, 15 feet above the surface.

Work on the Pili–Tigaon Road has continued during the past quarter, though little progress has been made on account of bad weather.

Five kilometers have been resurfaced on the Naga–Albay Boundary Road.

Stone is being delivered for resurfacing the Daet–Mercedes Road. Due to the heavy truck traffic and rainy weather, this road has become almost impassable during the past few months.

The second-class road between Tigaon and Goa has become almost impassable for automobiles during the past few months due to wet weather and heavy truck traffic. It is planned to make this road first class during the year 1918.

All building work has been delayed on account of lack of cement.

ANTIQUE.—Four kilometers of the Antique–Iloilo Interprovincial Road are already graded, and surfacing will be started in January, 1918, on the sections already graded.

The ₱39,000 available for the rest of the work will not be sufficient to complete the work, as most of the heavy construction is to be done in the 4 kilometers to be graded, and an additional amount of ₱20,000 will have to be appropriated for the completion of the work. Regarding labor conditions here, about 3,000 men leave this province every year to work in the province of Occidental Negros and although there is not available data as to the percentage of them that remain out of the province the whole year, yet it must be presumed that a great percentage of them do so.

There is at present in this province 48.4 kilometers of road entirely graded with 15-meter right of way along the following sections:

	Kilometers.
Sibalom to San Remigio	10.0
Malandug–Sibalom via Egaña	10.4
San Jose–North Road	22.0
San Jose–South Road	6.0

Both the roads from Sibalom to San Remigio and from Malandug to Sibalom via Egaña should be completed as first-class roads during the coming year. Both of them lead through productive, agricultural and industrious districts which with the aid of these roads, will be greatly benefited. To complete these sections an amount of ₱53,000 is needed and an amount of ₱41,000 will have to be appropriated.

Both the San Jose–South and the San Jose–North Roads offer serious problems in the matter of road construction owing mostly to the wide and changeable river beds that the road has to cross. These rivers, Sibalom, Ipayo, Cangaranan, Paliuan, Cairauan, Dalanas, Tibiao, and Bacong, along the north, have to be properly controlled in order to lessen the difficulties of fording them and the rivers, Linaban, Asluman, Pacuan, Arasasan, and Dao, on the south road, though unchangeable, offer difficulties to being bridged.

An appropriation of ₱15,000 is needed during the coming year to control the Sibalom river.

Plans and profiles for the Tibiao–Culasi section of San Jose–North Road are mostly completed. Location surveys for the Culasi-Bitadton section and Lauaan-Barbaza section will be started in January, 1918. Lauaan-Barbaza section comprises kilometers 50 to 56 and Culasi-Bitadton kilometers 84 to 93. Bitadton to Pandan section, comprising kilometers 93 to 120, a mountainous region, will have to be surveyed for a trail location of 4-meter width.

Half of the amount ₱25,000 allotted for the construction of Capiz-Antique road has been assigned to this province for the construction of the road on the Antique side, and work will be started as soon as the allotment is received.

Work on the water supply system for the town of San Jose will also be started in 1918. It is a gravity system and ₱33,000 has already been appropriated. The plans of the proposed system are already approved.

Owing to the Sibalom river which continually threatens the municipality of San Remigio, the town will have to be moved and plans prepared for a new location of San Remigio. This new town site of San Remigio has been tentatively located in a mountainous region.

The investigation of the proposed San Jose wharf is almost completed, all the surveys and profiles being completed as well as part of the borings. The boring investigation will be carried out to a depth of water of 5 meters at lowest tide. There is a coral reef extending 193 meters from the beach seaward where the water is shallow, especially at low tide. An estimated amount of ₱60,000 will be needed for the construction of this wharf which will be about 197 meters long to extend to a 4.5-meter depth of water at lowest tide.

The Sibalom market which was started April 9, 1917, is almost completed. Work on the San Jose market which was started May 9, 1917, is also completed with the exception of the tables. The Sibalom market cost ₱17,975.26 and the San Jose market, ₱13,560.40.

An appropriation of ₱14,500 is available for the construction of a presidencia at San Jose, Antique, and work will be started as soon as the detailed plans for the proposed presidencia are received.

BATAAN.—Most of the materials to be used in the construction of Orani market are being delivered by the Bureau of Supply. Location stakes have been already set and as soon as the necessary bolts for the columns are received, its construction will be started.

The construction of culverts on the Lubao-Hermosa Interprovincial Road was begun in November, and the culverts pertaining to the Bataan section of the road will soon be completed. The grade of this road has been raised to the proper height and surfacing of same will proceed immediately.

The Balanga–Bagac Telephone Line is now in progress of construction. 350 brackets and posts have been already set in the ground, and about 4,000 meters of line stretched.

The Pilar Irrigation System is yearly appreciated by the water users, and the irrigated area of this year is greater than that of previous years.

The district employees and camineros have closely coöperated with the provincial and municipal officials in the food campain. Coöperation was extended to the officials of the Bureau of Education in this province for the preparation of the garden day celebrations.

BATANGAS.—On account of rains during first part of the quarter and harvesting during the latter part, little work has been done on road work other than maintenance.

The road through Tanauan, also the road from Batangas to Bauan, has had the resurfacing completed thus completing all the resurfacing which was intended to be done during the fiscal year.

Construction work on roads throughout the province, which had to be suspended during the third quarter on account of the rainy season, was resumed during December. One kilometer was completed on the Tanauan–Bañadero Road, and about 1 kilometer was graded on the Alitagtag–Cuenca Road. On account of scarcity of labor, work was not reopened on the Rosario–Bolbok Road.

The recommendation submitted to the provincial board for declaration as first-class road shows an increase of 3 1 kilometers for the half year ending December 31, giving a total kilometerage of first-class roads for the province of 154.7 kilometers.

A 5-meter bridge has been completed on the causeway just west of Lemery on the Lemery–Calaca Road. This bridge is on wooden piles with a concrete cap which forms the footings for the masonry abutments.

The Dayapan bridge on the Ibaan–Rosario Road was completed during the quarter. This bridge, a 16-meter semicircular concrete arch on masonry abutments with an inclosed 6.5-meter slab and girder span on one side and one of 7.5 meters on the other, should have been completed several months earlier but on account of lack of cement, was only finished in December.

Market construction was started on markets at Nasugbu, Balayan, and Bauan during the quarter but, due to the lack of cement, work has been suspended on all concrete work. Carpenters have completed the cutting and framing of all roof truss material. Practically all materials other than cement have been received for a plan No. 20 school in Bauan and a plan No. 4 in Alitagtag. These schools will be rushed as soon as cement can be obtained. It will be impossible however to complete either of them for use before the next school year.

The Legislature having made a special appropriation for a school in the barrio of Talaga, municipality of Tanauan, which barrio is the birth place of Apolinario Mabini, the school to be erected as a monument to his memory, it is presumed a special design will be prepared. However this has not been done to date, nor has the money been released; nevertheless this office is being asked when the corner stone will be laid. This office has recommended that the old home of Mabini be acquired and the school be located on the same site, which is on the Tanauan–Talisay Road.

The Taal Water Works which was constructed in 1915, the engines and pumps to be supplied by Germann & Co. under contract, was not completed at that time due to the contract calling for Otto Diesel engines which, due to the war, could not be obtained. Under terms of the contract, if the engines were not available on time a temporary engine would be installed and used until such time as the permanent engines could be obtained. As more than two years had elapsed with no prospects of obtaining the permanent engines any time within the near future, a supplementary contract was made whereby a different type of engine was to be furnished. This supplementary contract was signed October 9, the plant to be completed on December 7. A complete pumping test was made after the plant was completed. The two pumps running at full capacity pumping 250 gallons per minute each, in eight and one half hours continuous pumping gave a very satisfactory performance. This test indicates that the supply is quite sufficient for future needs.

In connection with the water supply an electric light system has been installed. The same engines used for pumping are also used for driving the dynamo. On account of all the electrical plant not yet having arrived, a provisional lighting system was installed, which will be replaced with permanent equipment as soon as the other material arrives. This should be during January. The temporary plant was completed and the first light turned on December 8, 1917. The plant was formally inaugurated on December 13 during the annual town fiesta. This was attended by the Secretary of Commerce and Communications and numerous Senators and Representatives from Manila. The inauguration was witnessed by a large gathering of people and followed by a banquet in the home of Senator Ilustre and later in the evening, a dance in the municipal building. The inauguration was a great success both as to the performance of the plant and as a pleasant gathering. The municipality of Taal has the distinction of being the only municipality within the Philippines with a municipal-owned water and light system. The district engineer has been made acting superintendent of the water and light system. When operation was begun on the water system about two years ago the board on account of the high cost of water meters adopted a fixed monthly tariff for water based upon the value of the property connected. At the present time the pumps are pumping more than four times the amount of water paid for. An effort is being made to have meters installed and it is strongly recommended to others who have similar plants to operate that meters be installed from the beginning as it is much easier to place the meter then than it is to change after the system is once under operation.

BOHOL.—On account of the scarcity of laborers in this province practically all construction projects are at a stand still. On the Loay–Interior Road, construction projects are at a stand still. On the Loay–Interior Road construction an average of only 25 laborers per day have been available since October. Besides the lack of laborers the heavy rains during the past months also have made construction work difficult. The road from the rock quarry to the crusher was made impassable to bull carts, consequently no rock could be crushed during the past few months.

The same conditions exist in the construction of the Guindulman-Cogtong Road and the Guindulman–Candijay reconstruction.

Three standard reinforced concrete culverts have been completed on the Interior Road. One standard culvert and three culverts have been completed.

The construction of Taoran bridge is progressing very slowly because of the scarcity of laborers. Two piles have been driven so far. The material encountered below a layer of about 80 centimeters of sandy mud is white decomposed limestone and coral. The reinforced concrete piles could not be driven through it. So excavation was made for each pile to the required depth. The material is chipped off with a crow bar. Two men are required for each hole, one does the chipping in the hole and the other hauls up the material. When the required elevation is reached the pile is lowered down and hammered 25 times. No perceptable penetration can be noted. The hole is then filled in with gravel in layers, each layer being thoroughly tamped.

In the construction of the Loay waterworks the same labor trouble as in other projects is encountered. About 6,000 meters of 3-inch pipe have been placed and the headworks control is completed. The source of supply of this system is a spring located at the side of a small creek. In order to prevent the water of the creek from mixing with that of the spring a diversion dam is constructed about 4 meters above the spring. This dam consists of large boulders piled up neatly, having a base width of 1.50 meters, top width 1 meter, and height 1.60 meters. The voids are filled in with small rocks of various sizes and anapog is used to cement the parts. The dam is practically watertight and a heavy flood in October 6 did no damage whatever.

The control dam is reinforced concrete 20 centimeters wide at the top with a slope of 7 centimeters on each side, length 6 meters with a waste weir, 1.22 meters wide, 12.5 centimeters high. An open 3-inch pipe is placed 10 centimeters below the weir and 40 centimeters to the right of it.

The sum of ₱6,000 has been made available for the extension of the Tagbilaran water system to the town of Dauis on the island of Panglao. The job has already been advertised. The work will consist of constructing a distribution tank back of the town and connecting same with the 2-inch main pipe line of the Tagbilaran water system which has already been extended to within one kilometer of Dauis.

BUKIDNON.—Practically all supplies have now been received for the construction of the office and residence of superintendent of schools at Malaybalay, and work will start soon.

The maintenance of the road from Maluco to the Misamis boundary has been kept up with such success, that the road is continually open for automobile traffic regardless of the rainy weather. Nearly all rivers have been spanned with provisional timber bridges. These bridges have been put up with the idea of carrying the traffic for two and a half or three years. A system of drain boxes, constructed of 2-inch molave planks, is being used on hill side road, placing 12-inch drain boxes from 50 to 75 meters apart. Due to the continual use of drags no washouts have taken place to any extent.

The construction of the Malaybalay–North Road has progressed very satisfactorily through the Atogan Canyon, and the rough grade through the section of 11 kilometers is nearly completed.

Surveys have been made locating the proposed road through the Kulaman Canyon. A very good grade has been found, but the road from Maluco to Impasugong has been lengthened by 6 kilometers.

The telephone system has a double line from Agusan to Impalutao which gives a direct line from Malaybalay to Cagayan. For the first time the line is now working quite satisfactorily.

The Malaybalay–Western Misamis Boundary Road has now 16 kilometers open to automobile traffic which leaves the Cagayan river crossing at kilometer 149, all that prohibits automobile traffic to Talacag. It is planned to put a provisional bridge across this river, using the bowlders that lie in the river bed for piers. Practically all the work for the construction of this bridge will be accomplished by voluntary labor, with the exception of concrete which should be placed on top of the bowlders to raise the bridge above high water.

BULACAN.—A wooden school building as per plan No. 7 of the Bureau of Education is being constructed by administration in the municipality of San Rafael, Bulacan. Seventy-five per cent of the work has already been completed.

The construction of the Calumpit Central School of the Pasig type will begin on receipt of materials from the Bureau of Supply. The total fund available for this project is ₱46,000, consisting of Insular aid and loans.

The construction of the Santa Maria river bridge has already been advertised but no bid having been received, the work will soon be undertaken by administration.

Great interest and activity is being shown in tree planting. Fruit trees are being planted along the provincial roads, particularly on first-class roads. Mango, santol, mabolo, and tamarind trees will be the future ornaments of the roads and in addition will give profitable results.

CAPIZ.—All road and bridge construction in this province has been severely hampered during the past year by the incessant and excessive rains. There has been an unprecedented amount of precipitation during the last quarter of 1917 and rivers have been high practically all the time.

There are now in existence 146.4 kilometers of first-class roads, representing a net increase of 1.1 kilometers over June 30, 1917.

Due to very unfavorable weather, work on the Tangalan–Ibajay Road, kilometers 31, 32, and 33, has been slow.

Plan and profile of the Mianay–Sigma Road has been recently completed. This road will open up a rich rice and sugar country and will connect Sapian, Ivisan, and the surrounding country with the railroad at Dao.

The Mobo Bridge, a reinforced concrete slab and girder of two 7-meter spans on pile bents on the Calivo–New Washington Road, was inaugurated and opened to traffic on October 14, 1917. This structure replaced the only wooden structure on the most important road in the Aclan section.

The construction of the Sooc pile bridge and overflow section on the Calivo–Ibajay Road, has been retarded due to delays in furnishing pile materials and plans.

Difficulty in securing good gravel suitable for maintenance work has been recently solved. Quarries have been opened along the first-class road between Capiz and Pilar, ranging from 8 to 10 kilometers apart, to provide sufficient stone to be crushed. In order that all crushed stone might pass a 1-inch screen it was necessary to recrush the 1½-inch and 2-inch sizes. A Champion No. 4 jaw crusher has been used in this work. This work has proved very economical, costing as low as ₱1.50 per cubic meter at crusher site, and provides excellent maintenance material which cannot be carried away by heavy rains when placed on the road. A Ford one-ton truck was requisitioned to solve the hauling problem from the crusher site to different road depositories. The maximum haul is from 4 to 5 kilometers.

CAVITE.—A Bureau of Education special plan No. 10 school building has recently been completed in the town of Kawit for its central primary school. It will be known as "Aguinaldo School" in honor of General Emilio Aguinaldo.

The building has the same general dimensions as shown on the standard plan, but with solid walls from the foundation up to the floor line, iron grilles under each set of windows, concrete partitions with manganese dioxide blackboards, cement tile roof, and double front doors making a very fine looking building and quite different in appearance from the regular standard plan.

Authorization for the construction was approved May 25, 1917, and work was started at once and it was finished during the later part of November 1917. Expenditures were as follows:

Miscellaneous	₱1,096.31
Labor	7,159.56
Materials	17,405.61
Provincial and Insular surcharges	1,861.53
Total expenditures	27,523.01
Total appropriation including Insular aid	27,523.01

The final repair to the Tres Cruces Dam has been finished with the ₱8,000 alloted for that purpose.

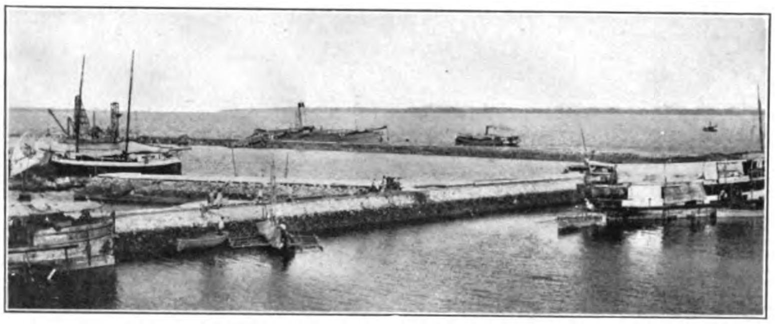
The repairs to the Culung-culung Dam located on the Naic friar lands estate, province of Cavite, is now being started with an appropriation of ₱10,000 alloted from the Bureau of Lands funds. The work on this dam will consist only in repointing same.

The work on the San Roque–Cañacao Road is progressing rather slowly. There is not enough stone being shipped from quarry due to shortage of cars. The road roller for this job is also being tied up for shortage of boiler tubes.

Subgrading for the last remaining 6 kilometers of the Naic–Indang Road is progressing satisfactorily.

Work on the Cavite garbage incinerator has been suspended because the land on which it was proposed to be located has not yet been acquired by the municipality. Materials are already on the ground.

CEBU.—The necessity of dredging at the north end of Cebu wharf extension has delayed work somewhat on this project during this quarter. An orange peel bucket used on this work has excavated some 2,000 cubic meters. Since December 4, a sea-going dredger belonging to the Insular Government has been used on this project.

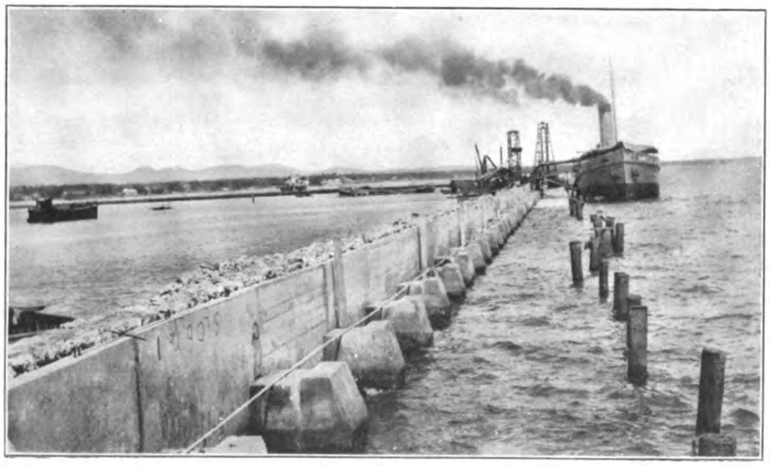


Cebu Harbor development. The inclosed area is to be filled and reclaimed.

The plans call for 94 back piers; of these 66 are now in place and pile foundations have been driven to include the 77th pier. The pile driver has been laid up temporarily to enable the concrete gang to catch up. The back piers are now being put in at the rate of about one daily.

Coral rock for fill is being delivered at the rate of about 125 cubic meters per day. To date 44,480 cubic meters have been delivered.

The construction of the Cebu Intermediate School being indefinitely postponed, some of the materials ordered for this project have been transferred to the Carcar school project. The site for the Carcar school has been staked out. Materials for the project are being ordered. The work will be done by administration as soon as all the materials are on hand.



Cebu Harbor development. Back piers in place.

The construction by administration of the Liloan, San Fernando, Danao and Sibonga markets is well under way. Materials are being requisitioned and the work will be started as soon as possible.

Two more projects in school construction are projected. Estimates of the cost of constructing standard plans No. 4 and No. 7 are being prepared at the office. The construction of these two school buildings in the municipalities of Alegria and Ginatilan is contemplated in the near future by the division superintendent.

COTABATO.—The Cotabato Public Hospital has been completed according to the original plans and is without doubt the most modern building in the province. In conjunction with the department horticulturalist, plans have been evolved for the beautification of the town of Cotabato. The rank growth has been cleaned from Constabulary Hill, thousands of plants set out, and a winding road to the hospital and the summit of Constabulary Hill has been located and construction commenced.

Preparations have been made for the arrival of the Steamship *Dredger* to deepen the mouth and channel of the Cotabato River to allow department and commercial boats to proceed to the town of Cotabato. At the present time only small draught boats can enter the river and then only at extreme high tide. Tentative plans allow for raising a portion of the town of Cotabato above high tide, an area of 400,000 square meters being diked off to be raised one meter.

In the town of Cotabato, 950 linear meters of metalled roadway with section 4 meters wide have been placed, the rock being secured at a cost of ₱2 per cubic meter from the quarry behind the town. Approximately 12,000 square meters of land have been filled with sand, varying in depth from 20 centimeters to one meter, costing 70 centavos per cubic meter in place.

Unexpected and rapid erosion of the river bank at the mouth of the Manday Estero threatened the building of the Rio Grande Estate soap factory located on Insular property. Rush work in constructing a river wall of one-man stones topped with riprap have saved the land and building.

A temporary market 15 by 50 meters in size is being constructed at Salimbao, in the municipal district of Nuling. This building has concrete footings, timber columns, trusses and roof frame, and a nipa roof.

A new No. 40 Rife ram has been installed in the Parang waterworks, the complete battery consisting of one No. 60 Rife, one No. 40 Rife, and one No. 40 Niagara ram. This battery in twenty-four hours raises 20,000 gallons 60 meters to a concrete reservoir.

Construction is under way for the Awang waterworks. Water is brought 300 meters through an open canal to a No. 40 Rife ram and is to be raised 77 meters to a 5000-gallon concrete reservoir.

Concrete piles are cast for the Tarbung Bridge but the lack of a pile driver has caused construction to be stopped. The province is expecting to buy, or construct, a pile driver in 1918.

The well at Dulauan has reached a depth of 1,550 feet with no indications of water since the brackish water which was passed at a depth of 1,100 feet.

Surfacing has been placed on the Kudarangan–Fort Pikit Road to kilometer 3.8 and bridges No. 4.6 and No. 10.5 have been given protection roofs of nipa.

A temporary cart traffic bridge, 58 meters long and 3 meters wide, has been constructed on the Inugug–Dunguan Trail giving a shorter route from the Agricultural Colony, at Pagalungan, to Inugug.

The telephone line has been completed to Banisilan and projected to within 10 kilometers of Kalawaig where it will connect with the Lanao Provincial Telephone Line to Dansalan.

The superintendent's quarters, teacher's quarters, Constabulary quarters, and the framework of the dormitory of the Banisilan Agricultural School have been completed. This project is 65 kilometers from Fort Pikit on the Pikit–Lanao Trail. Owing to the distance all lumber has been cut on the site at an average cost of ₱50 per thousand board feet for molave and lauan.

Location work on the trail from Kidapauan to the Davao boundary, being a continuation of the partly completed Pikit–Davao Trail, was interrupted due to a Moro outlaw raid followed by Constabulary operations.

Investigation and report to the department governor have been made on the possibility of a dredged canal across the Liguasan marsh from Kabasalan to Buluan.

DAVAO.—Work has been started on the telephone line from the wireless station at Cuabo to Piso, the Davao Commercial Company's plantation at Piso having furnished the labor for this construction, the Province furnishing the material and foreman.

The Mati sea wall is about 40 per cent completed and work is still going on, but shortage of labor is causing some delay.

Over 400 telephone poles have been replaced on the Davao–South Telephone Line and about 200 more will have to be replaced. This line has been causing much trouble by the poles rotting off and falling down.

Davao wharf.

The maintenance of the telephone lines in this province is causing much trouble, through scarcity of good linemen.

Resurfacing of the Davao–Santa Ana Road was started in November but has been stopped until the arrival of new contract laborers from Cebu.

Park, provincial grounds, Davao.

A new location for the Davao–North Road and the telephone line has been completed and work will be started as soon as labor is available. Twenty Bilibid carts have been received from Manila and 19 carabaos purchased from the East Coast. This equipment will be used in resurfacing the first-class roads and the Davao–South Road.

The wharf at Santa Ana is in bad condition and must be rebuilt, owing to the damage done to the piles by the teredo. It is estimated that ₱30,000 will be necessary to place it in good condition.

The Talomo–Guianga and the Daliaon–Bagobo district trails are under construction from the coast to the interior and will open up large sections of good agricultural land which is controlled by the Bagobos who are very progressive.

ILOCOS NORTE.—Actual construction on the Laoag provincial building was started in the latter part of November. The footings for the entire building have been placed.

One of the two proposed provincial storehouses is now under construction. It is a 10.40 by 24.15 meter one-story building, with brick walls and cement tile roof. The design of these storehouses has been prepared in the office of the Consulting Architect. It provides for good lighting and ventilation, the appearance of the buildings as a whole being a pleasing one. It is hoped that the one situated on the northeastern corner of the provincial building will be ready for occupancy by the end of March, 1918.

The construction of the Bangui school (plan No. 10) is progressing very satisfactorily. It is believed that with the continued cooperation of the public-spirited citizens of Bangui who are donating all the lumber necessary to construct the said building, the municipality will, within three months, be in a position to offer excellent school accommodations.

The reconstruction of the Vintar school has progressed so far that both the upper and the lower stories can now be used for school purposes. The partitions, ceilings doors, and windows for the lower story are still lacking. These will be constructed as soon as more funds become available.

Nearly all the materials for the Paoay school construction, except the cement, are now on hand. Work on this building will commence soon after the arrival of the cement which has been requisitioned from Manila.

The corroded roof of the Banna Central School, Bureau of Education plan No. 3, has been repaired and given two coats of red Deco paint at a cost of ₱423.48. Several minor repairs on the doors and windows of this building were also made.

The repairs of the Bojeador Lighthouse have been completed. The total cost of the 1917 repairs amounts to ₱1,502.20.

On the San Nicolas–Dingras Road, the entire subgrade from the end of the finished first-class road section (kilometer 13) up to the road junction at Milamilan (kilometer 18), a total distance of 5 kilometers, all bridge and culvert structures and 2 kilometers of first-course surfacing are now completed. Part of the traffic between Dingras and Laoag has been diverted to this new road since October, 1917. It is expected that this road project will be completed by the end of the coming quarter.

Due to present cold weather prevailing on the northern coast of Luzon, progress on the construction of the Bangui–Claveria Trail has been very slow. Only two small gangs of laborers remained during the past quarter, a maintenance gang to clear the slides and to widen the road in places where same has been damaged either by the slides or by the rain itself, and a dynamite gang to rebuild the destroyed trail at the Mabugabug Falls. Many laborers are expected on this road project by the end of January, and it is expected that a horse trail between Banua and Pasaleng will be entirely blasted out by the first of March.

The surveying party has staked out the trail between Pasaleng Hacienda and Langangan, Mountain Province. On the Banua–Subec section, the only unsurveyed section between Banua and Bangui, 4 kilometers of trail have also been surveyed. The entire trail survey between Pasaleng and Claveria will be submitted shortly for approval.

An appropriation of ₱2,000 for river control has been requested for 1918. An effort will be made to establish at least three gaging stations at the earliest practicable date. The Badoc, Laoag, and Vintar rivers have been selected for the purpose of stream measurements.

ILOILO.—Work on the Miagao–San Joaquin Road which was started last May, is now practically all completed. Only about 1.5 kilometers remain to be finished. It is possible that in the middle of January, 1918, the whole project will be completed, thus giving a first-class road of about 53 kilometers from the city of Iloilo to the town of San Joaquin.

A small part of the Iloilo–Antique Interprovincial Road is under construction. From Tiolas to the barrio of Quianan a distance of about 3.5 kilometers there is already a graded road, well surfaced with gravel but not yet rolled. In all probabilities the greater part of the subgrade will be finished during 1918, provided an additional appropriation is made to the ₱50,000 already appropriated. Expensive construction will be encountered in these mountainous regions. It will be necessary to use explosives for the greater portion of the road. When completed this will be the first road to give the two provinces free communication by land.

In order to finish the San Miguel–Leon Road, an additional amount of ₱7,000 was appropriated last October. Work is being pushed to completion. Leon is an important town but its importance will be greater still when the road is completed.

Pototan–Dueñas Road is almost completed, only about 3 kilometers remaining unfinished. Probably during 1918 an additional appropriation can be obtained and the road completed.

Road work is not confined to the city of Iloilo and to the interior towns but is extended to the island of Guimaras. The old road near the town of Buenavista and the road in Jordan (both roads were built by the U. S. Army) were repaired, thus giving the farmers in Guimaras the facility to carry their products to Iloilo.

Sounding of the Iloilo River has been done so as to have a definite map of the river bed. From this map the points in the river bed to be dredged are determined.

The dredge has been working satisfactorily and has filled up several lots or low places belonging to different persons. At present it is filling the lot belonging to Assumption College. Many applications for filling are coming to the office but, due to insufficient pipe, certain applications have not been accepted.

Building construction for the last quarter of 1917 was mostly confined to markets and presidencias. La Paz market, 21 by 36.10 meters, at a cost of ₱21,700; Estancia market, 15 by 35 meters, at a cost of ₱15,336, and Passi market, 21 by 43.50 meters, at a cost of ₱24,040 have been completed with the exception of tables which are now under construction by administration. All these markets are of reinforced concrete with galvanized-iron roofs.

The municipal building of San Joaquin has been constructed at a cost of about ₱17,800 and the municipal building of Janiuay was repaired at a cost of about ₱13,000.

The construction of the Iloilo concrete wharf, in front of the new customhouse building, is now going on. The cofferdam form to be used is now almost ready to be launched. It is to be launched by simply sliding it down along timber ways with the aid of jackscrews. This form is a double-walled open box; the outside wall is designed to resist a water pressure of 22 feet; and the inside one to resist the pressure of a layer of concrete that may be poured at one time.

ISABELA.—The construction of Cauayan–Angadanan Road is progressing very slowly due to lack of labor. Only 1.4 kilometers have been completed. Arrangement has been made to secure about 300 laborers from the Ilocos provinces.

The following buildings were completed during this quarter. Two wooden temporary structures at Cabagan school for shop and domestic-science buildings, provincial storeroom of permanent construction with concrete floor and galvanized-iron roofing and walls, and a wooden temporary structure at Ilagan for provincial domestic-science building.

The Cauayan Presidencia will soon be completed.

Materials for Cabagan Central School, plan No. 7 have been requisitioned. Construction will be started as soon as materials arrive.

Next year there will be a great demand for lumber as there are about seven wooden school houses, one municipal building, and one market projected. The difficulty in getting materials coupled with the lack of means of transportation will only be solved if the province operates its own sawmill.

LAGUNA.—The subgrade of the Biñan–Carmona Interprovincial Road has been completed. Four 60-centimeter and three 30-centimeter standard reinforced-concrete culverts were completed on this road. The surfacing will be put on this coming dry season.

The contract for the construction of the Calamba market, 30 by 43.5 meters in size, was awarded to Mr. Tam Samco, a contractor of Manila. About 20 per cent of the building is already finished.

The construction of the Lilio–Nagcarlan Road has been suspended, with the exception of the bridge construction, due to the incessant rains. However, after the rainy season, this project will be opened again in full force.

A temporary timber superstructure was constructed over the substructure of the Bañadero River bridge, the south abutment of which collapsed in part due to underscour. A topographical survey has been made of the bridge site and test borings taken in the river bed.

Especial attention in maintenance of first-class roads is being given on the Manila–South Road, between Rizal boundary and Los Baños, the Calamba–Vigaa and the Calamba–Canlubang Roads, due to the heavy traffic caused by the two sugar estates and the military trucks which carry supplies to Camp Eldridge at Los Baños.

Repairs have been made to the Lumbang–Siniloan third-class road. Deep mud holes were filled up, and the road thoroughly drained.

A 5-kilometer road survey has been made for a first-class road between Mavitac and Santa Maria. This road will give an outlet for the agricultural products of the inland town of Santa Maria to the bay via Mavitac. Due to the present limited funds a road 4 meters wide, including shoulders, with 15 centimeters of surfacing will be constructed first, and as funds are available it will be widened and made into a first-class road.

The construction of the San Diego barrio school, standard plan No. 4 will be started by administration as soon as the materials arrive.

During this quarter the output of the Los Baños Insular Quarry has amounted to 6,528 cubic meters. The greater portion of this was shipped to the province of Rizal.

LANAO.—The maintenance of the Overton–Keithley Road has been going on under difficulties. This road was turned over to the Civil Government by the military authorities on July 1, 1917. Sections of the road were in a very bad state of deterioration, side ditches were too small to carry the intercepted water and consequently the wheel tracks of the road were drainage ditches, which resulted in the sweeping away of nearly all of the dressing and in places the metalling was washed off the telford base. Besides these evil results the earth forced its way up between the telford, the road bulged in the center and mud came up through the metalling. Hence the road is being repaired to make it passable. The enormous rainfall during October and November aggravated conditions. In the latter part of August the province purchased a 1½-ton White truck which has been continuously in service and has been practically the only available means of transportation. This road must be surfaced very soon otherwise it will never give satisfactory service as the whole is very wavy, uneven, and has too high a crown together with a narrow metalled width (3 meters), the center of the road therefore receiving severe punishment.

The Iligan ford was opened to traffic in November, though not finished due to shortage of funds and danger of washing away of concrete deck while under construction during the rainy season, should a sudden freshet occur in the Iligan River before set. The temporary deck on this bridge is the standard collapsible bridge deck which has been giving very good service. The bridge will be finished sometime in March when further funds become available for that purpose.

The Ganassi school building is practically finished and two of the three school buildings of the Lumbatan Farm School are completed. These buildings are of standard Bureau of Education plan No. 3 dimensions but are made of wood with a cogon roof and bamboo rafters.

The senior inspector's quarters have been completed. This building is the only complete modern dwelling in the province of Lanao. It consists of a sala, dining room, four bedrooms, two bathrooms complete with sanitary water closets, hot and cold water shower baths, white enamel bathtubs and lavatories. In the rear is the kitchen with boiler, sink with hot and cold water taps, servants' quarters, pantry and bathroom and water-closet for servants. The waste from the closet is drained into a septic tank. The house has a concrete stairway and sidewalk. The inside finishing of the sala and dining rooms is in natural colors with oil, the bedrooms are painted lead color, while the bathrooms are painted with zinc oxide. The cost of this building complete, including sanitary installation, grading, etc., was about ₱12,500. The cost is rather high probably due to the fact that many changes in plans were made and construction was drawn out over a period of two years.

The construction of operating room and women's ward, Lanao Public Hospital, has been completed. This project, however, involved the screening in of the entire hospital, constructing a kitchen, moving back and rebuilding the water-closets, painting the whole exterior and a greater portion of the interior besides remodeling several rooms. The operating rooms have concrete floors and wainscoating. Bathrooms have cement floors. Soil pipes are laid with specials in place so that if a water system is provided it will be possible to install sanitary water-closets.

The military reservations with buildings and other appurtenances, including the water systems at Overton and Keithley, will be turned over to the Province of Lanao sometime in January, 1918. This will propably result in a change of the provincial capital from Dansalan to Keithley.

In addition to the above-mentioned changes, the wharf at Overton will be turned over to the Civil Government, though it will necessarily require considerable repair.

LA UNION.—With the exception of some 600 linear meters at the Camp One end and some 900 linear meters at the Aringay end, the subgrade of the Camp One–Aringay Road is now ready to be rolled and then graveled. Since December 16 this road has been open to traffic. Although the subgrade in some section is too rough for fast driving, the fords, temporary spillways, and provisional structures are in much better condition than last year.

Only 200 linear meters of subgrading remains to be done on the Agoo–Tubao Road. If additional funds, as has been promised by the provincial board, are made available immediately, every effort will be made to open this road to traffic by the end of January, 1918. The concrete pipes are fast being placed but some of the provisional structures will have to be constructed later.

Materials have been requisitioned for the Luna market, a standard market 15 by 31 meters in size.

The Baroro River bridge, consisting of twenty-two 9-meter girder spans on reinforced concrete pile foundations, is now complete and was opened to traffic on January·1, 1918. It is contemplated to make this a toll bridge for a period of five years.

LEYTE.—The first-class road system is now in excellent shape from Tacloban to Burauen (43 kilometers), but the Palo-Carigara section is in bad shape. At present it is closed to wheel traffic from kilometer 17 to kilometer 25 and from kilometer 35 to kilometer 54.

Work will shortly be started on four presidencias. One of 9.4 by 22.9 meters at Burauen and three of 9 by 15 meters at Palo, Alangalang and Abuyog. All are standard reinforced concrete buildings. The one at Burauen is estimated to cost ₱53,861.89 and the one at Palo ₱25,196.38; Alangalang, ₱26,045.09; and Abuyog, ₱26,575.54.

No bids having been received for the Cabalian school (Standard plan No. 4), work has been started by administration. A bid of ₱5,140 by Eugenio Jaro for labor only was received for the Burauen market (21 by 32.40 meters in size). It has been decided to reject the bid and to do the work by administration. Material has been requisitioned, and work will commence shortly.

The only bid for the Dulag market was that of Eugenio Jaro for labor only in the amount of ₱2,632. This was also rejected and the work will shortly be begun by administration.

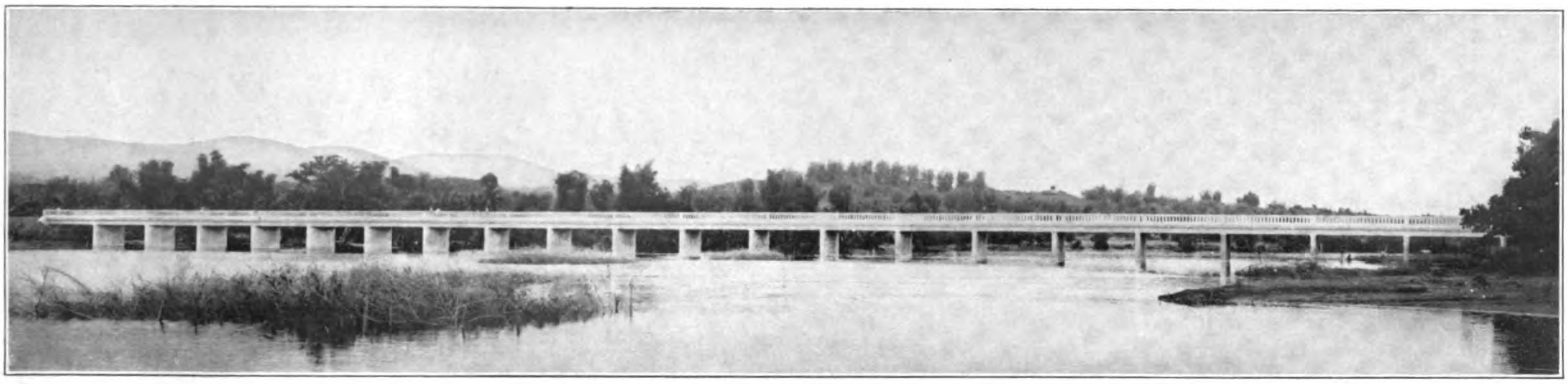
The province is gradually getting rid of its old coal burning equipment and replacing same with crude oil engines. Two 15-horsepower Fairbanks-Morse crude oil engines and one of 20-horsepower have recently been bought. All are in operation and the results are extremely satisfactory.

Requisition has been made for another 10-ton roller and a No. 4 gyratory crusher.

The work of driving piles for the provincial building has progressed at an unsatisfactory rate due partially to difficult driving and partly because of lack of labor. Much time was lost at first in moving the pile driver from cluster to cluster but this has been obviated by putting large rollers under the pile driver.

The tower for distributing concrete has been erected. It is 42 meters high, which will allow a 33 per cent grade to the highest part of the building.

The survey of the Abuyog–Baybay Road has been abandoned till after the rainy season.



Harrison bridge, Baroro River, La Union.

A reconnaissance survey has been made of the Burauen–Albuera Road to determine whether or not there is any possibility of building the West Coast Road along this line. The reconnaissance developed that while it is possible to build a road along this route it will not only be expensive construction but also will require very expensive maintenance.

The toll system to date has averaged a revenue of ₱2,200 per month.

The amount of money spent under the jurisdiction of the district engineer for 1917 was about ₱515,000.

MINDORO.—A plan No. 3 barrio school, semipermanent in type, is to be soon constructed at Agcauayan, Lubang, materials for which have already been ordered. Likewise of the same type, a plan No. 2 school building is to be erected at Abra de Ilog.

Due to weather conditions and lack of funds on some projects, road construction is progressing slowly.

The construction of the Calapan waterworks is completed. House connections have likewise been started and to date about sixty have been connected. Regular operation of the system starts in January.

The construction of the Silonay River bridge is nearly completed.

MISAMIS.—The construction of the Misamis–Lanao Interprovincial Road is going steadily forward. Gangs of Moros have been imported from Lanao Province who have accepted "paquiao" jobs and have greatly assisted in the progress of this project. A new 2.5 per cent grade, in place of an old 8 per cent grade, has been constructed in kilometer 3; a 2.5 per cent grade has been finished at the entrance to the barrio of Bulua; a 5 per cent grade is now under way at the exit of this barrio; a fill 1,000 meters long, coral rock surfaced and sodded, but not yet rolled, has been built across the tidal flats near the barrio of Opol; a level road has been blasted out around a headland in this barrio to eliminate a bad ascent and descent; and a new standard timber trestle bridge has been built across the Alubijid

River. The approaches to this bridge are being opened up, which will eliminate half a dozen unnecessary ups and downs.

All of the low timber trestle bridges built on the Cagayan–East and Cagayan–West Roads have gone through the entire rainy season without a break. The concrete approaches to the one at the Umalag River have been subjected to many overflows without harm and have thereby saved the back fill which would have been lost had it not existed.

The concrete ford at the Bigaan river became covered, after a time, with green slime that proved very slippery to horse traffic, but a vigorous sweeping with street brooms was found to be the remedy.

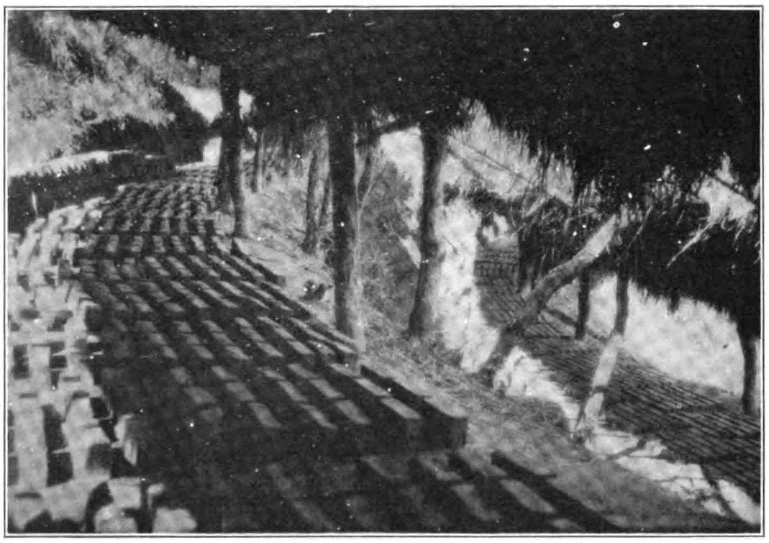
Four kilometers of first-class road were completed on the Mambajao–East Road; as also a new 6-meter standard timber trestle bridge of two spans which eliminated a bad reverse curve.

The new cut-off across the swamp between Tudela and Jimenez has been widened to 5 meters on fills and 6 meters in cuts. Only two short sections remain uncompleted. Work has been started on a temporary truss bridge across the Labo River where pile bents cannot safely be placed in the channel.

The fencing of the provincial and municipal school grounds has been completed but the gates have not all been hung. Repairs to the Mambajao Intermediate Trade School building are under way.

MOUNTAIN PROVINCE.—Grading on the Cervantes–Tagudin Road has been completed between kilometers 10 and 30, except for two small contracts. The road is now open for automobiles from Tagudin to Butac (kilometer 30). Motor traffic will be suspended, however, during the rainy season until the completion of the suspension bridge at Urzadan (kilometer 18) for which funds have been requested.

At the summit, 51.5 kilometers from Tagudin, a cut of 12 meters below the present grade, containing 6,000 cubic meters of rock, is being taken out by contract. This will eliminate a short switch back on heavy grades.



Brick drying sheds, Lepanto subprovince.

Brick for the Bauko and Sabangan Presidencias in Lepanto is being manufactured under considerable difficulties. Daily rains have necessitated cover for drying the bricks and there being no level ground near the clay deposit, the hillside has been terraced to provide space for the drying sheds.

NUEVA ECIJA.—The rainy season continued in this province until the middle of December and owing to the unusually large rice crop it has been impossible to get laborers in this province for road work.

Three kilometers of grading have been completed on the San Jose–Nueva Vizcaya Road. This work was done mostly by children and old men who were not able to do the ordinary work required on a farm. At present there are 50 Igorrotes from the north end of this province, working on the San Jose–Nueva Vizcaya Road. These men make very good laborers for maintenance work.

Owing to quarantine of work animals and shortage of labor, it was impossible to complete the four kilometers of unsurfaced road of the Manila–North Road, at the north end of this province, and in order to make this road passable 20 centimeters of volcanic ash, which is found in that vicinity was placed with a crown of 5 centimeters and then rolled with a 10-ton roller. This makes a very good road for light traffic and will remain solid in ordinary rains, but becomes muddy if rains are continuous for a period of three or four days as is quite common in this province.

The province has at present 75 immunized carabaos and vacas which are not effected by quarantines and which will be used to haul gravel for the Manila–North Road as soon as laborers can be obtained.

The collapsible bridges at Gapan and Cabanatuan have been replaced and are at present in good condition and will carry 3 tons. The Gapan Bridge was replaced three times in the month of November, but owing to continuous rains the bridge washed off twice soon after being replaced.

One more successful well has just been completed in the municipality of Jaen. The drilling of another well will be undertaken at Cabiao.

OCCIDENTAL NEGROS.—The municipal building for Bago was completed in December and occupied by the municipal officials on January 1. It is a two-tory structure of reinforced concrete with concrete floors and galvanized-iron roof, 17.70 by 11.70 meters in size. On the ground floor are the offices of the municipal treasurer and the chief of police, with prison cells and storerooms. The second floor provides for the president, secretary, justice of the peace, municipal health officer, and post-office, in addition to the assembly hall which can be made to include the court room and the rooms of the president and secretary, by removing two movable partitions, making a sala, approximately 17 by 7 meters, where public receptions and dances may be held. The inauguration ceremonies, which promise to be of considerable magnitude, will be celebrated within a few days. Mr. Monico Puentevella of Bacolod constructed the building under an "Obra de Mano" contract for ₱8,800. Total cost of the job including lawn improvements will be ₱36,000.

The bridge over Sumag River, known as the Osmeña Bridge, has just been completed by J. W. Ford & Co., of Iloilo. This structure is a concrete slab and girder bridge on reinforced concrete piles, having 6 spans of 9 meters each. The pile caps are of the rounded nose type which have a decided advantage over the square ones, since they do not catch bamboo and other drift so readily. This bridge has the distinction of being the first bridge in the islands with a hand rail of colored balusters. The balusters were made of 1:2:3 concrete with red oxide of iron thoroughly mixed with the cement. Since too much red retarded the setting of the cement, it was found necessary to paint the balusters after they had seasoned a few days. A pigment made by mixing the ferric oxide with water was first used and gave the desired result as far as color was concerned, but washed off with the first water applied. After the handrail had been cast over the top of the balusters, they were painted with two coats of red oxide with boiled linseed oil, which gave excellent results. The insertion of deep red balusters in the balustrade of a long bridge gives a very pleasing effect and it is believed will meet with the same favor in other provinces as it has here. The contract price for the job, excluding steel and waterproofing, was ₱17,250. The total cost of the bridge complete with long heavy approaches is ₱30,000.

Construction of the bridge over Candaguit River has been delayed by continued heavy rains and floods in the river. Both abutments and piers have been concreted to the springing line and formwork for the three arches is now being erected. The job should be finished by the middle of February if no serious floods interfere.

Contract has recently been awarded to Monico Puentevella for the construction of a block of eight double tiendas 4 by 5 meters on the Bacolod market site. The structure is to be reinforced concrete with a flat iron roof. Contract price, ₱17,000.

Construction of the Manapla–Cadiz Road, 23 kilometers in length, has been continued in spite of the rainy season. The road has been surfaced as far as the barrio of Caduhaan, 7 kilometers from the Manapla end. Some surfacing was done on the Cadiz end, but the road roller working there was suspended in the early part of this quarter. Transportation of gravel has been a serious problem from the beginning. The importation of labor from the islands of Panay and Cebu has finally been approved for this project and the action of the Bureau of Labor toward supplying the men is now awaited. In case this trial squad proves successful as much labor may be imported into Negros Occidental as the Philippines have heretofore exported to Hawaii.

The Bago–Maao road work has been carried on under difficult weather, labor, and transportation conditions. A few public spirited hacenderos in the vicinity of Maao have taken tramway and animals out of their sugar fields to assist in the delivery of gravel on this road. Two road rollers are now awaiting dry weather to finish the surfacing into Maao.

Funds are now available for the surfacing of a section of third-class road from Valladolid to San Enrique, a distance of 6 kilometers This section is in the southern end of 100 kilometers of first-class coast road and has been left unsurfaced on account of the well-drained sandy material in the subgrade. Motor vehicle traffic on the Pulupandan–South Road now demands that this be made first class. Gravel has to be hauled from the Bago River, approximately 10 kilometers. Four 1-ton trucks have been requisitioned and will be given a try-out on this job. The road being perfectly level, trains of trailers are anticipated.

Construction of the Talisay–Concepcion Road was well under way when the rice harvest epidemic struck it. An average of 150 men had completed 6 of the 12 kilometers of subgrade. After harvest time came it was extremely difficult to find even 30 men. Work is now progressing slowly.

All of the right-of-way on the Eustaquio Lopez–Nacayao Road has been donated to the province in lieu of a road through the fertile sugar lands in the municipality of Silay. Construction of the subgrade is being aided by some influential hacenderos in the vicinity of Eustaquio Lopez.

Construction of the subgrade from Bacolod to Granada, a distance of 9 kilometers, is about complete. Although sufficient funds are not available to surface all of this road, the worst section will soon be surfaced, giving numerous hacenderos a good road over which to haul their sugar and other produce.

Surfacing of the Himamaylan–South Road has been made passable to auto traffic as far south as Biniquil bridge. That section of about 3 kilometers between the bridge and Kabankalan has been too wet to support a road roller for the past 18 months, but most of the gravel has been delivered and will be rolled when dry weather permits. This is beyond doubt the most unpopular piece of road in the province.

Resurfacing of the 8 kilometers of the Talisay–Silay section of the Bacolod–North Road was finished in November. The old gravel surfacing which had worn very thin, was scarified and thrown out to both sides and the new gravel rolled in the center. The old material was then used as binder and shoulders for the new surfacing with exceptionally good results.

ORIENTAL NEGROS.—A nipa-roofed presidencia was recently completed and occupied by the municipal officials at Tayasan. It is intended to replace the roofing with galvanized iron later.

Contracts have been let for furnishing surfacing materials for the Dumaguete–Luzuriaga Road, 7.1 kilometers, and the Dumaguete–Bacong Road, 7.5 kilometers in length. The rolling will be vigorously prosecuted and it is expected to complete both roads by July, 1918.

Requisition of materials for a No. 7 school building at Siaton has been made and work will be immediately started as soon as all the materials are received. It will be temporarily roofed with nipa which is being furnished by the municipality.

One kilometer is still to be surfaced on the Amblan–Tanjay section. It is hoped to finish this section by the end of January.

Heavy and incessant rains have wrought some damage on the roads of the subprovince of Siquijor, a big landslide cutting off 200 meters of road having occurred on the Larena–Maria section.

PAMPANGA.—All the grading on the Pampanga section of the Lubao–Hermosa Road has been raised an average of 20 centimeters. The construction of concrete pipes has started by contract and at present 80 linear meters have been completed. One kilometer of surfacing from Lubao has been completed. In bringing the 10-ton road roller to Lubao a cracked concrete slab bridge had to be crossed. The task was rather difficult as there was no lumber on hand long enough to span it. A truss was erected using No. 9 galvanized wire for tension members.

The construction of the Mamatad Bridge has been completed thus closing the widest and most important opening in the Arayat–Cabiao Road with the exception of the Pampanga River. Great difficulties were encountered in the construction of this bridge as work had to be done under water. Besides, the size and weight of the lumber did not permit the framing of bents on the ground.

All the concrete pipes on the Nueva Ecija section of the Arayat–Cabiao Road have been completed. Material is on hand for some of the rectangular culverts but work cannot begin as there are no funds available.

All the Mexico–Magalan Road is planted with mango trees on both sides. Lately, more than 2,000 mango seedlings were received from the Bureau of Agriculture to be planted along the Manila–Tarlac Road.

About 5.5 kilometers of subgrade have been completed on the San Matias–Minalin Road, 3 kilometers of which are declared first class, reaching the important barrio of Santo Tomas, making in all an increase of 13 kilometers of first-class road in six months, making a total of 149 kilometers of first-class roads.

Municipal streets were constructed during the last quarter in the towns of Magalan, Arayat, Santa Ana, Macabebe, Masantol, and Santa Rita; 3.4 kilometers of streets were surfaced and 3.2 kilometers were graded. Much of the above street work will continue this year.

Kilometer 87 of the Santo Domingo–San Luis Road, which was formerly very soft, has been packed down by an old front wheel of a 6-ton Kelly Springfield road roller. The roller is pulled by a carabao and is very satisfactory in soft subgrade utilizing at the same time a useless road roller part.

Work on Floridablanca Central School, standard plan No. 6, has been rapid and the building is 50 per cent complete. Materials were all on hand when work was started.

The Candaba Central School, standard plan No. 7, is 40 per cent complete. This is the only wooden school building under construction and there has been considerable delay due to the difficulty of getting first-group lumber from the forests of Mount Arayat.

The addition of two more rooms to the San Luis Central School to complete a standard plan No. 6 is 50 per cent finished. Work on the addition of the unfinished Guagua Market Building is 35 per cent complete. These projects show clearly the feasibility of the principle of constructing at first a part of a structure with the idea of continuing the work later on when there is more money available.

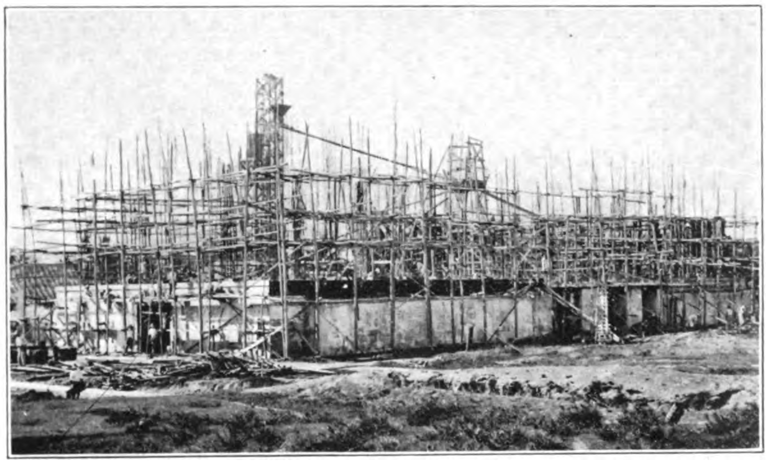
Repairs of the San Simon Central School and Apalit municipal building have been completed and painting has started.

The lack of laborers which was felt during the month of December has hindered the work in general in the district. The scarcity of labor is due to the excellent crop of rice and sugar cane and the urgent need of bringing these products to the market.

PANGASINAN.—Work has progressed rapidly on the capitol building at Lingayen. This building has an exterior finish of 2 inches of mortar made of cement and crushed limestone aggregate. Both the proper mix and manner of placing required many experiments. Finally slotted galvanized-iron forms were used, slotted to pass the bolts holding the exterior forms in line. Galvanized-iron pieces were 30 inches in depth. The mixture for artificial finish was one cement to three aggregate, limestone running in size from dust to stone 3/8 inch in diameter. A special gang of men were trained for this work and used on this work only.

The large columns, so situated that the smallest variation would be detected, presented a new difficulty. At first a steel form was suggested, but no firm in Manila was willing to undertake this work, so a concrete form was the only resort.

A model column, exact size, was constructed and a negative sectional form was cast. To date one-half of the number of columns have been successfully poured, and the forms are still in excellent condition. Objections are excessive first cost, weight, cost of labor needed to make the desired speed, and salvage when columns are completed.



Pangasinan provincial building, under construction.

The ornamental artificial stone manufactured in Manila, arrived on the site in good condition. The pieces already installed on the exterior of the building produce a dignified and decorative effect.

The concrete is completed to the second floor line. With the exception of the corridor, forms are ready for pouring second floor in west wing.

A gang of prisoners is employed in grading the grounds around the new capitol building and in grading and draining the various streets and boulevards. The site is rapidly assuming form and should be completed by the time the building is ready to be occupied.

Arrangement has been made with the various property owners to extend the Provincial Boulevard from high school grounds to Calle Castillo.

Provincial toll bridges were constructed across the Agno River at Carmen and Oa-oa.

The San Carlos Plaza-Farm School Road was graded and surfaced during past quarter.

Repairs to the extent of ₱3,500 were made on the Bayambang Intermediate School.

During past two years, various sugar companies have enlisted laborers from this province for work in the cane fields. So many have been taken that the province for the first time in years has a labor shortage. This is especially noticeable at this time, as it is exceedingly difficult to secure sufficient laborers to harvest the bumper rice crop. Moving the present rice crop and the planting of the tobacco land will, it is believed, cause a serious shortage in cart transportation for road work during the coming dry season.

RIZAL.—Extensive resurfacing has been carried on during the last quarter on the Manila–Novaliches Road, the Junction–Malabon Road, the Manila–North Road through Caloocan, and the Manila–South Road between Pasay and Parañaque. A special train has run from the Los Baños Quarry daily with crushed rock and screenings for this resurfacing. All material has been used as fast as received and considerable progress has been made. Work has been delayed somewhat, because of the shortage of laborers who have been working in the rice fields.

Work on the approaches and causeways to the Navotas Bridge was started in October. A great number of houses were moved from the right of way and retaining walls for holding the sand fill have been carried out into the estero to one end of the bridge location. Work on the bridge itself will be started the first of January.

Grading on the San Juan del Monte–Mariquina Road has been progressing very slowly on account of the rainy weather. The heavy grading has all been completed, however, and the finishing of the subgrade is now in progress. Gravel will be placed as soon as the weather permits.

The proposed timber trestle bridge between McKinley and Pateros has been advertised and construction authorized by administration.

The Pasay Matadero has been completed at a cost of ₱2,500. This building is 6 by 17.3 meters in size and of similar design to standard market construction. Twelve wooden-top market tables have been changed in the Pasay Market to standard concrete fish and meat tables.

Construction was started on the Las Piñas four-room school the last of November. Concrete work will be finished by the beginning of January and construction completed early in February. This work is being carried on by administration.

The Pasig water-supply system has been completed except for installing the pumping machinery and electrical power lines. This will all be completed and the system in operation by January 15. An immediate improvement of health conditions in Pasig is expected.

Authority has been received and grading started on the proposed extension of Avenida Rizal from the Manila City boundary to the monument at Balintawak. The right of way for this boulevard is 25 meters. Present plans call for a 10-meter width between shoulders with 7-meter surfacing. An appropriation of ₱25,000 is available for this work.

A small timber domestic-science school is being completed by administration in Antipolo.

SAMAR.—The number of cedulas sold during the current year in Samar shows a remarkable increase over the 1916 record, due to the cedula campaign which has been in progress throughout the year. The final figures are not available at this date, but it is known that the number of cedulas sold is considerably in excess of 100,000 as compared with 81,000 during 1916.

Repairs to the seawall of the Constabulary Barracks at Catbalogan have recently been completed at a cost of approximately ₱500.

Materials for the standard plan No. 10 schools at Basey and Guiuan have about all been received and work begun on the Basey building. Both of these buildings will have red cement tile roofs.

Work was commenced on the new block of tiendas for the Calbayog market in November.

The first automobile over the Sabang–Oquendo Road reached the town of Oquendo, 13 kilometers north of Calbayog on December 6. All subgrade work has been completed and the surfacing will be continued from Sabang immediately after the first of January.

Work on the Catbalogan–South Road has continued without interruption throughout the year while the Catbalogan–Calbayog Road is progressing rapidly with a force of 200 Cebuanos. Both projects will be continued without interruption. Wheeled transportation can now reach kilometer 17 north and kilometer 10 south. Kilometer 18 on the north road is about completed. Eight new kilometers have been added during the current year to this road. It is proposed to increase the force on the Catbalogan–Calbayog Road by the addition of 300 more Cebuanos after January first if they can be obtained. The construction force on the Sabang–Oquendo section will be immediately transferred to Tambungan and thereafter the uncompleted section will be under construction from both ends.

The new No. 3 Austin gyratory crusher is being installed at the Maulong quarry on the Catbalogan–North Road. This will be operated by a 15-horsepower Fairbanks–Morse crude-oil motor which has been received. The crusher plant and quarry have an unusually advantageous location being on the edge of a landlocked bay, close to deep water, and less than 1 kilometer from the first-class road with which it will be connected, making available both water and land transportation. An unlimited supply of a fine grade of coraline limestone is available.

The first contract on the Calbayog jetty was completed on November 10 and work is continuing on the second contract without interruption. An estimate is being prepared for dredging a 25-meter channel to a depth of 5 feet at low tide. The channel will run due south from the river mouth parallel to the jetty. Work of dredging can be accomplished most economically by using the Bureau of Public Works hydraulic dredge. The opening of this channel which the jetty has made possible will expedite the handling of cargo at this port.

SORSOGON.—The heavy rains of the last quarter have done considerable damage to the various roads, especially the Sorsogon–Gubat Road. There are now ten passenger trucks running over this road and in nearly every kilometer the light surfacing has failed. It will be necessary to resurface this entire road during the coming year.

Cement arrived the last of November and immediately work was started on replacing posts in the provincial school building. On removing the floors and ceiling, a greater deterioration was found than was expected. This will increase the cost of repairing this building greatly.

On the Sorsogon–Albay Road, the contractor, J. V. Pappa, has nearly finished the grading from kilometer 5 to 10 and has rock prepared for the surfacing on kilometer 5 to 8, which will be spread and rolled as soon as the weather permits. Grading on kilometer 11 and 12 has been about finished by administration and sufficient rock has been obtained for surfacing.

The grading for the Casiguran–Juban section of the Sorsogon–South Road has been let by contract and the contractor has about fifty men at work. This section should be finished by the end of January, 1918, and the grading on the Casiguran–Gubat section, being done by administration, should be finished by March 1, 1918.

SURIGAO.—There is little activity in road work during this quarter. Frequent rains render transportation difficult and all construction costly.

The culvert construction done on the Surigao–Badas Road is appreciable. From January 1, 1917, to the present, 50 culverts, most of which are of concrete pipe, have been constructed. The timber trestle bridge of 15-meter span to replace the old Spanish bridge in kilometer 3 of the same road has been completed. All materials used were first class and it has been roofed.

During 1918, two bridges of the same type are to be built. Much difficulty is being encountered in transportation due to scarcity of carabaos, and the quarantine laws. The province will soon have a Ford motor truck which will greatly assist the slow going carts used at present.

The telephone line now reaches Badas, a barrio about 7 kilometers from Placer. Another line from Bilangbilang to the office is under way. When this shall have been completed and the line to Badas extended to Placer, much facility in road movements can be had.

TARLAC.—The condition of roads in this province during this quarter has been moderately improved on account of slight decrease in the frequency of rains.

About half of the materials for the construction of Victoria Central School has already arrived at Tarlac. Work on this project will be started as soon as the materials are delivered at Victoria.

Considerable difficulty has been encountered in resuming the work on the construction of Tarlac–La Paz Road owing to the scarcity of laborers and bull carts for hauling gravel, occasioned by the bumper crop of rice in this province. After having been delayed for nearly a month, sufficient laborers have been obtained and the work is thus resumed in a satisfactory manner. All owners of bull carts passing over this road are hauling as many cart loads of gravel as convenient.

Nearly all the materials for the construction of the superstructure of the Camiling Bridge are already on the site and over one-half of the steel structure has already been assembled and erected. The bridge will be completed about February.

The construction of the Gerona–Pura Road is progressing. About 2.5 kilometers of first-class road have already been completed on this project.

Nearly all the grading on the Concepcion–Magalang Road has been completed with the exception only of some short sections which are still under water and could not be economically worked.

TAYABAS.—Maintenance of first-class roads during the quarter has been particularly difficult, because of continued rains and labor shortage. A tremendous cocoanut crop, together with a rise in market price of copra, has drained the labor forces of the province, and caused heavy bull-cart hauling. The rice crop is also one of the best in many years and there has been an unprecedented demand for field labor. Resurfacing work on the Lucena–Tayabas section has been discontinued, because of lack of funds, but extensive repairs to the main road through Lucena will be completed, as it carries very heavy traffic. The section from Lucena to Candelaria is very rough, as the binder lost in the 1915 typhoons has never been replaced. Six kilometers of the Tayabas–Lucban road are in a similar state for the same reason. The heavy rains and traffic cut up the Atimonan road considerably. Funds are assured for top dressing the through road in 1918, which will bring them again to standard condition.

New kilometer posts, showing the distance from Manila, and between adjacent towns, have been installed as far as Lucena and Lucban. The remainder should be completed shortly after the new year.

The Tayabas–Lucban Road has been completed to the church plaza, together with a connecting road to the schoolhouse. This road forms part of the system which will ultimately encircle Mount Banahao, and is an important link in the transportation facilities of the province.

The Atimonan–Siain Road construction has been greatly retarded by continuous rains. Much damage was done to subgrade, and the effort to keep the road open to traffic has been costly. One kilometer has been surfaced, but no culvert construction has been done, owing to lack of cement. The total number of cocoanut trees destroyed thus far is 1,073, of which 1,064 were paid for, at ₱4.50 each, as bearing trees. Nonbearing trees were not paid for. No trouble has been experienced in securing right-of-way under the revised form of "Convenio."

Work on Sariaya school building was temporarily suspended owing to lack of materials. Hy-Rib partitions are being constructed, and appear to be satisfactory. The manganese-oxide blackbards are the best thus far constructed, as a result of experience gained on former projects. The town of Sariaya has also requested data and estimates for a sewer system for the entire poblacion.

The Candelaria domestic-science building was completed at a cost of approximately ₱4,000. A dance was given to celebrate the inauguration of the structure.

Gumaca market building, type A, 15 by 34.5 meters in size was completed and occupied during the quarter. This building cost ₱11,369.25 leaving a balance of ₱252.03. The balance is being utilized for construction of a matadero and the town is making provision for a temporary water supply for washing the floors of the two structures.

With the aid of the high-schol students, the athletic field at the high school was sufficiently graded to permit holding the Southern Tagalog Meet at Lucena, for the first time. Heavy rains marred the work of the athletes, but the visitors were unanimously of the opinion that the field promises to be one of the best in the Islands. Two provisional outhouses, using the Bureau of Health standard sanitary seat system were completed, at a cost of less than ₱600.

Materials are being received for construction of a type B market building, 21 by 43.5 meters in size, at Lopez. A Bureau deep-well rig is at work in Lopez.

Reconstruction of the old school building at Tayabas is practically complete. Three standard-sized rooms will be available. Alterations are under way at the present Central School building which will materially increase the capacity of the structure.

Prospects are bright for the best public works era Tayabas has ever known. Tax collections have been the greatest in her history; bumper crops insure prosperity; and the people, both in official and private circles, are unanimously working for the good of the province. Under normal conditions, an active construction year would be inevitable, and even with the present material restrictions, much work will be accomplished.

MARINDUQUE SUBPROVINCE.—High water destroyed a few short sections of road in the vicinity of streams south of Gasan, but, otherwise, maintenance has continued, as usual. Two temporary wooden culverts were replaced by concrete box culverts, in which odds and ends of steel, which had accumulated for many years, were used.

Construction of Mogpog–Balanacan Road has been practically suspended. The rice-planting season in Mindoro causes an annual exodus of labor from Marinduque, which ties up public works on the latter island. Heavy rains caused some damage to subgrade on this project.

Ihatub spillway was badly damaged by a flood which occured while the concrete was still green. It will be reconstructed, with a downstream apron, as there are no large rocks available for riprap.

A small appropriation was made available for clearing the Timbo trail, but labor shortage prevented effective work.

Boac river hurdles were tested by a flood during the quarter and performed satisfactorily. The current cut in between the bank and end of the last (down-stream) hurdle and scoured out about 3 meters, and the brush filling of all the hurdles was carried away to a great extent, but the results, as a whole, justified the selection of this type of protection work. The main bank of the river at the danger point was not scoured; a slight accretion to the protected shore line is evident, and the main channel has been appreciably shifted away from the danger point. Permanently good results can be reasonably expected.

ZAMBALES.—The construction of the Subic–Castillejos first-class road has been very slow during this quarter due to the continuous rains in the first half of the quarter and on account of the rice cutting season. There is only 1 kilometer of finished road completed. All the land owners between Subic and Castillejos have donated land for the necessary right-of-way.

The maintenance gangs on the Iba–South Road are keeping this road in fair shape and the repair of the section between San Felipe and San Narciso, which was washed out is now about completed.

A pipe culvert north of Lucapon bridge has been finished. Another pipe culvert at kilometer 21.21 is completed. These pipes replaced temporary wooden culverts.

One temporary bridge has been widened and reconstructed with first-group timber and it is now passable by carts and other vehicles, while only horses and people on foot could pass over it before. This is on the Iba–Palauig Road. The Bato Bridge on this same road is being repaired and widened, the lumber for this now being hauled to the bridge site.

On the Iba–North Road, the San Lorenzo wooden bridge, kilometer 22.2, and the Kinabuañgan at Masinloc, kilometer 30.1, have both been repaired and widened, first-group timber having been used.

The section between kilometers 35 and 41 has been surfaced with unscreened gravel and is now in good condition.

The section between kilometers 38 and 59, is now passable all the year round for all kinds of traffic and it is now classified as second class.

ZAMBOANGA.—A third-class road has been completed between the barrios of Mercedes and Taluksangay, a distance of 5 kilometers. This is a feeder road for the Zamboanga–East Coast Road. It is hoped to place light surfacing during the coming year.

Bids will be opened on January 4 for the reconstruction of the Isabela River bridge. The new structure will differ from the old pile bridge in that the central span is to be a 50-foot wooden truss.

Test borings have been completed along the line of the proposed seawall which will be undertaken during the coming year in connection with the Zamboanga port works improvement. By means of the seawall an area of nearly 20,000 square meters of foreshore land will be reclaimed for bodega sites and the new customhouse.

Proposals have been requested for furnishing lumber and constructing a lighter 30 by 80 feet in size. The lighter will be used on port works construction.

During a severe storm in November several sections of the Zamboanga–San Ramon Road were practically washed away by wave action during high tide. This together with heavy truck traffic has so seriously damaged this road that extensive reconstruction and resurfacing will be necessary during the coming year.

The November storm showed the necessity for some form of protection for the Government coal piles at Caldera Bay as waves broke around the base of the coal piles and some wash occurred. A coral seawall is now being constructed along the beach in front of all coal deposits.

Despite the high cost of building materials no noticeable decrease occurred in the private building operations in the city of Zamboanga during 1917. The district engineer's office granted permits for 17 new buildings, 11 additions, 27 repair jobs, and 58 electric light installations during the year.

FINANCIAL.

LOANS FOR ROADS, BRIDGES, SCHOOLS, MARKETS, MUNICIPAL AND PROVINCIAL BUILDINGS, WATERWORKS, ETC., FROM OCTOBER 1, 1917, TO DECEMBER 31, 1917.

Provinces and projects.	Act No. 1749.	Total.
Albay:		
Albay market	₱23,000	₱23,000
Tabaco market	30,000	30,000
Cebu: Bogo market	17,000	17,000
Occidental Negros: Bago municipal building	15,000	15,000
Tarlac: Capas-Concepcion Bridge	30,000	30,000
Total	115,000	115,000

SELECTED.

THE ROAD'S LAMENT.

By H. Stanley Haskins.

Up spake the road, with grit in its teeth
And a whirl of dust on its spine:
"I long for the feet of the vanished horse
That sped on this breast of mine:
The laugh of the belle with the red parasol,
The youth with the bold black eye.
Lo, customs must stale and habits must change,
And the belles and the beaux must die;
The prancing feet of the high-bred mare,
The stride of her haughty sire,
Have yielded them in this insolent day
To the rush of the ruthless tire.
Alas for the roll of the carriage wheel!
Alas for the friendly neigh!
The automobile has honked an end
To the vogue of the carriage day!"
Thus spake the road, with mud in its teeth
And the rain of tears on its spine:
"I long for the feet of the vanished horse
That sped on this breast of mine!"

[*From Highway Magazine.*]

APPENDIX A.

CIRCULAR LETTERS ISSUED BY THE CONSTRUCTING DIVISION FROM OCTOBER 1, TO DECEMBER 31, 1917.

MANILA, P. I., *October 26, 1917.*

Constructing Division Memorandum No. 7.

SIR: Your attention is invited to the attached copy of Department Order No. 9 of the Department of the Interior, dated September 12, 1917, relative to tablets or name plates for bridges, buildings, or other public works, which circular amends and supersedes all previous instructions issued.

You are directed to familiarize yourself with the instructions contained in this order of the Department of the Interior, and carefully comply with same when submitting requisitions or requests for tablets or name plates for bridges, buildings, or other public works in your district.

For the Director:

W. C. WEST,
Acting Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEER,
CONSULTING ARCHITECT,
DESIGNING DIVISION,
CITY ENGINEER, *Baguio,*
I. LAGNITON, *of Coron,*
ROMARICO AGCAOILI, *and*
JOSE DEL CASTILLO.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF THE INTERIOR.
Manila, September 12, 1917.

DEPARTMENT ORDER }
No. 9. }

For the purpose of standardizing tablets or name plates to be attached to bridges, public buildings, or other public works, the Director of Public Works has prepared a regulation specification which has been adopted and which will be used in the future wherever tablets or name plates are needed.

Hereafter, provinces or municipalities desiring tablets or name plates for bridges, public buildings, or other public works, will make requisition on the Bureau of Public Works, giving the following information:

(*a*) Name of public works.
(*b*) Date of completion.
(*c*) If provincial project, names of members of provincial board and provincial treasurer, or if municipal project, names of the municipal president, secretary, and treasurer, in office when work was commenced.
(*d*) Name of the district engineer with the prior approval of the Director of Public Works.
(*e*) Name of contractor, if any.

No names or information other than that above indicated will appear on the tablet or name plate, and no other tablet or name plate except the one containing the names or information mentioned above, will be attached to any public works, without the specific approval of the Secretary of the Interior.

Provincial Circular No. 67, of the Executive Bureau, as amended by Provincial Circular No. 106 and Provincial Circular No. 126, is hereby repealed.

RAFAEL PALMA,
Secretary of the Interior.

APPENDIX B.

PROJECTS ACTIVE OCTOBER 1, 1917.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plants.	Miscellaneous.	
Abra	2	3																		1							1				1		2	10
Agusan	3	4			1															3					1						1		3	16
Albay	2	3		1									1													1								8
Ambos Camarines	3	8			1	1				1			1							2	1				1	2								21
Antique	6	2			1					1										2				2				1						15
Bataan	6	3			1		1																								1		1	13
Batangas	4	4			2					1			3						1	1	1				1			2				1	13	34
Benguet	16	10	1		1		1																	1	2	9		3	1		1	1	20	67
Bohol	4	3			5															1					1	2		2					5	23
Bukidnon	2	1																								2					1			6
Bulacan	1	3			1															1						1							3	10
Cagayan	5	2			2	1				1			1							1	2	1			1	1	1						11	30
Capiz	7	2			8																					1	1						2	21
Cavite	8	2																		3		2											2	17
Cebu	9	2	1										3							2													5	22
Cotabato	9	4			2															9				1	2	2		2			1		8	40
Davao	7	4			1																				1						2		5	20
Ilocos Norte	4	2							1											3			2			2							2	16
Ilocos Sur	7	3													1	1				3							2						12	29
Iloilo	8	6	2				1						3											3	1			1		1	1		7	34
Isabela	3	2		1					1				2							7						1	1						3	21
La Laguna	5	2	1		2			1										1		5		1						1			1		2	22
Lanao	3	2						1												2						5							4	17
La Union	4	5			1															7					1		1						3	22
Leyte	1	2		2					1											3				1	1								4	15
Mindoro	3	3		1	2					1										2	1				1	1		1					1	17
Misamis	4	3		1	1															1								1					3	14
Mountain Province	15	10			2				1	4			2		1		1			6				1	1	10	3	3			2		12	74
Nueva Ecija	6	4																		2		1			1								2	16
Nueva Vizcaya	1	4		2																3													1	11
Occidental Negros	16	2		2	7								1					1								2	1						1	33
Oriental Negros	5	4								1			1	1						1								4			1		5	23
Pampanga	11	4						1					1		1					4		1		1	1		1						4	30
Pangasinan	7	3			1			1	1				1			1				2		1					1						5	24
Rizal	6	5			1								2							1	1					3		1					1	21
Samar	5	2			1															2							1							11
Sorsogon	7	4					1	1		1										4		1		2				2					11	34
Sulu	6	2			1															1				1	1	2	1	1			2		4	22
Surigao	1	2																		3													1	7
Tarlac	8	3			1																												1	13
Tayabas	6	3			1					1										5		1		2	2	3							5	29
Zambales	1	3			4															1														9
Zamboanga	5	5																		3					5	5		1			5		4	33
Total	242	150	5	10	51	2	4	5	5	12			22	1	3	2	1	2	1	97	6	9	2	15	25	55	15	26	1	1	20	2	178	970

NOTE.—Of the 178 projects under the caption "Miscellaneous" are 11 surveys and investigations of roads, bridges, waterworks, etc., 6 wharves, 7 irrigation ditches, 6 hospital buildings, 2 boundary monuments, 3 river control, 2 dredging projects, 3 dykes, 5 Constabulary buildings, 3 docks, 1 water tank, 1 irrigation system, 1 Customhouse, etc.

BUREAU OF PUBLIC WORKS

STAFF AND ENGINEERING PERSONNEL

E. J. WESTERHOUSE, ***Director of Public Works***
R. H. DOANE, ***Consulting Architect***
W. C. WEST, ***Acting Chief Constructing Engineer***
C. E. GORDON, ***Chief Designing Engineer***

Supervising Engineers
R. Agcaoili
J. C. Cookingham
F. T. James
W. C. A. Palmer
Claud Russell
A. D. Williams

Highway Engineer
W. C. West

Hydraulic Engineer
G. G. Stroebe

Designing Engineer
W. J. Grodske

Irrigation Engineer
G. R. B. Symonds

Electrical and Mechanical Engineers
L. L. Vincent
L. H. Thompson

Assistant Architects
Juan Arellano
Tomas Mapua

Structural Engineer
H. R. Kingsley

Chief Architectural Draftsman
Cheri Mandelbaum

Architectural Draftsmen
J. Altiveros
C. A. Barretto
V. L. Legarda
A. Toledo

Assistant to the Director
C. A. Tansill

Superintendent of Artesian Wells
Wm. Rader (absent)
F. C. Lawrence (acting)

Chief Accountant
L. E. Williams

Property Clerk
J. R. Kuykendall

Cashier and Disbursing Officer
Solomon Libby

Superintendent of Automobiles
Jose Paris

Record Clerk
Primo Villar

District Engineers
R. N. Allen
Alejo Aquino
A. W. Austin
J. H. Ayres
S. Baluyot
N. R. Baugh
C. R. Bennett
E. C. Brown
L. R. Brown
L. T. Clark
M. C. Collins
C. S. Dandois
V. Fragante
Luis Francisco
C. G. Gabelman
R. C. Gay
Leo J. Grove
E. J. Halsema
W. B. Honska
S. W. Hulse
Agustin Jereza
Marcial Kasilag
Isabelo Lagniton
S. Lopez
Juan Macaraeg
J. T. Marshall
F. X. Memije
B. F. Mills
Vicente Orosa
Jose Paez
Manuel Reyes
Mateo Roco
N. S. Saleeby
V. Segura
R. H. Shoemaker
E. D. Smith
A. T. Sylvester
Antonio Tayzon
Dalmacio Urtula
A. G. Yankey

Transitman
Ross Hagler

Surveyor
R. S. Frush

Junior Surveyor
Emilio Perez

Junior Electrical Engineer
Vicente Villanueva

Junior Mechanical Engineer
P. Avisado.

Civil Engineers
L. S. Boggess
E. C. Earle
Pastor Gomez
A. E. Haley
E. R. Hyde
Leon Ines
P. W. Mack
A. R. Pease
Teofilo Reyes
A. Richter
T. P. Scates
Pedro Siochi
Julian Vallarta

Assistant Civil Engineers
Melecio Arranz
R. A. Arevalo
J. V. Bagtas
G. Garcia
Jose Garrido
Jose Gandionco
Manuel Mañosa
Juan Piedad

Junior Civil Engineers
G. Alcantara
J. Arquisola
H. S. Clemente
Nicanor Cortes
Gustavo Cruz
Mamerto Cruz
Maximo Dimson
Leandro Espejo
S. Fernandez
Isaias Fernando
Rufino Garcia
M. B. Gochuico
M. Gonzales
Domingo Guanio
Jose F. Imperial
Jaime Laguardia
F. V. Larracas
V. F. Lavadia
Jose Lozada
Luis Mallari
G. J. Militante
A. P. Nitorreda
M. Operario
S. Tan Chauco
Rafael Ungson
L. Urtizberea

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BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS
PHILIPPINE ISLANDS

AUG 29 18

Quarterly Bulletin

VOL. 7. APRIL 1, 1918. NO. 1.

Malabon Bridge under construction on the Malabon-Navotas Road, Rizal.

156325

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1917

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

MANILA, P. I., March 15, 1918.

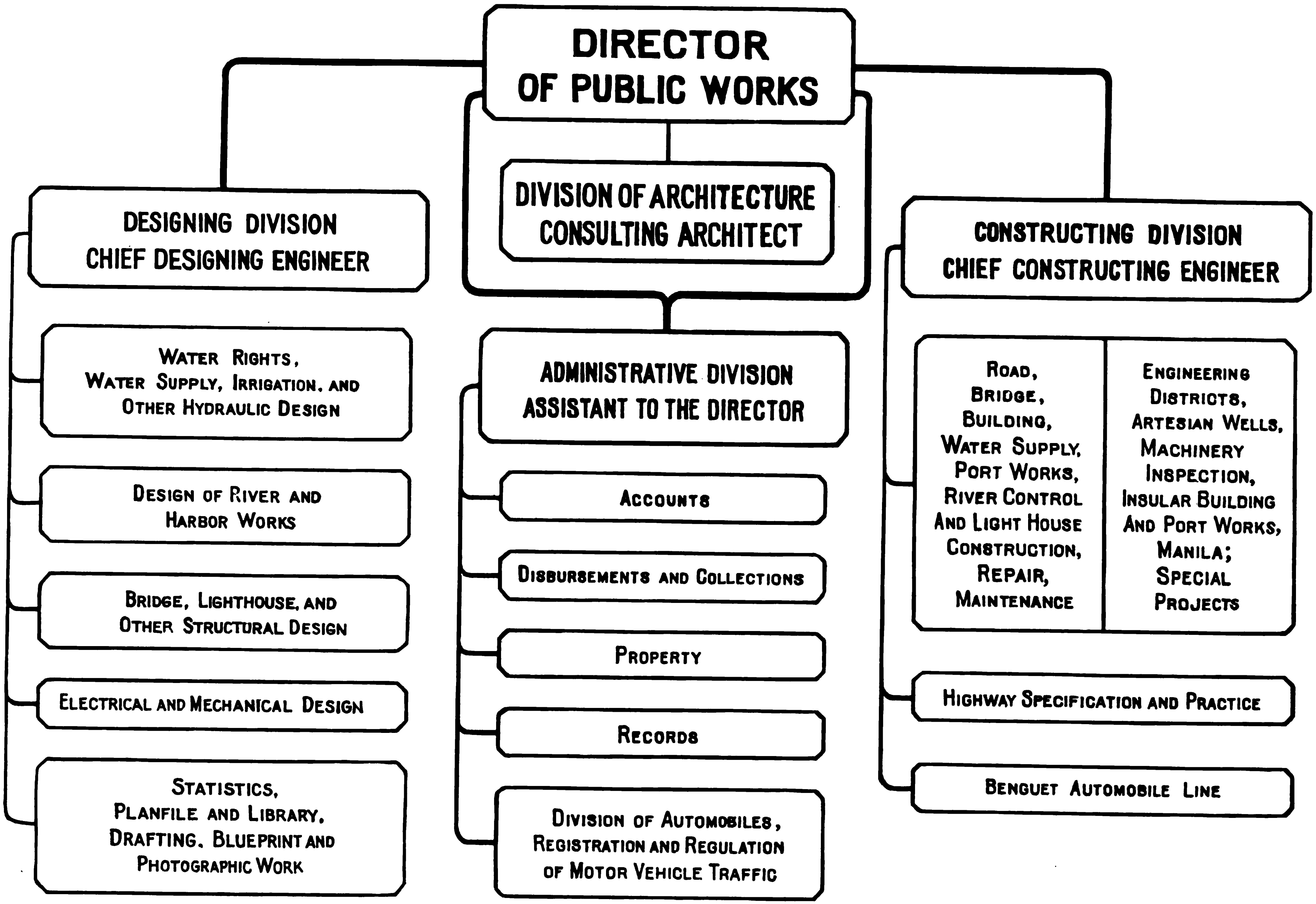
SIR: I have the honor to submit herewith the report of the Bureau of Public Works for the fiscal year ending December 31, 1917.

E J Westerhouse
Director of Public Works.

The Honorable
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1917.


DIRECTOR OF PUBLIC WORKS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
WATER RIGHTS, WATER SUPPLY, IRRIGATION. AND OTHER HYDRAULIC DESIGN
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE, AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS, PLANFILE AND LIBRARY, DRAFTING. BLUEPRINT AND PHOTOGRAPHIC WORK
DIVISION OF ARCHITECTURE CONSULTING ARCHITECT
ADMINISTRATIVE DIVISION ASSISTANT TO THE DIRECTOR
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHT HOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA; SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE

QUARTERLY BULLETIN

BUREAU OF PUBLIC WORKS
MANILA, P. I.

ISSUED QUARTERLY UNDER THE DIRECTION OF
THE DIRECTOR OF PUBLIC WORKS

C. A. TANSILL, COMPILER

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ORGANIZATION AND PERSONNEL.

The organization responsible for the execution of all public works consisting of a plan of central control with decentralized local administration, as outlined in the annual report of this Bureau for the year 1916 remained effective during the current year and demonstrated the flexibility of control and an efficiency of operation which fixes this method of administration as one particularly satisfactory for all conditions. The district engineer whose operations are coextensive with provincial limits and who represents the Director of Public Works locally is held rigidly responsible for the direction of all public works in accordance with the plans furnished by the Central Office or prepared locally with the approval of the Director of Public Works. Construction projects are selected by the provincial board thus insuring to the province concerned positive local autonomy, and in all matters pertaining to such projects the district engineer deals directly with the provincial board.

The officers and employees directly paid from the Bureau appropriation include 63 Americans and 232 Filipinos as against 84 Americans and 193 Filipinos for the year 1916. The technical personnel now includes 79 Filipinos, as civil, mechanical, and electrical engineers, architects and architectural designers, of which number a total of 45 are at present in the classified service and 34 holding temporary appointments in the unclassified service. The public-works administration in 19 of the 43 districts is directed by Filipino district engineers. As in the past these assignments are made to those who have qualified under civil-service regulations and who have had the most practical experience. The results obtained have been gratifying. The necessity for competent engineering supervision, however, is still such that the services of the present American technical personnel are absolutely essential for the expeditious and economical prosecution of public works throughout the Philippine Islands in both design and construction.

It is hoped that in a very few years the needs of the Government for qualified technical personnel will be secured from local sources thus eliminating the past and to some extent present constantly changing personnel which is not conducive of the best results in either design or construction.

PERSONNEL.

Number of employees paid direct from Bureau funds as of December 31, 1917: Americans, 63; Filipinos, 232.

Number of technical employees as of December 31, 1917: Americans, 43; Filipinos 79.

Filipino technical employees.

	Classified.	Unclassified.	Total.
Civil engineer	16	......	16
Assistant civil engineer	9	4	13
Junior civil engineer	5	23	28
Surveyor	1	......	1
Junior surveyor	1	......	1
Junior mechanical engineer	1	......	1
Junior electrical engineer	......	1	1
Assistant architect	......	2	2
Architectural draftsman	2	......	2
Senior architectural draftsman	......	2	2
Junior architectural draftsman	6	......	6
Supervising architectural draftsman	2	......	2
Assistant architectural draftsman	2	......	2
Superintendent of autos	......	2	2
Total	45	34	79

CHANGES IN PERSONNEL.

The figures in the following tabulation include all officers and employees under civil-service appointment and engaged upon work supervised by the Bureau, by whatever branch of the Government paid.

	Americans.	Filipinos.	Total, 1917.	Total, 1916.
Number of appointments	13	204	217	235
Number of transfers to Bureau	3	21	24	29
Number of separations for cause	1	9	10	15
Number of voluntary resignations	31	84	115	148
Number of separations due to economy	3	8	11	4
Number of transfers from Bureau	1	15	16	3
Number of separations due to retirement	10	......	10	18
Number of deaths	2	8	10	4
Total number of employees December 31, 1917	106	925	1,031	......

NOTE.—Item "number of appointments" includes new appointments and probational appointments.

Expenditures supervised by the Bureau of Public Works.

Item.	Insular expenditures.		Provincial and municipal expenditures.	Funds from private sources.	Total.
	Bureau of Public Works.	Appropriations controlled by other Bureaus.			
Roads and Bridges	₱70,957.34	......	₱6,077,256.11	......	₱6,148,213.45
Buildings	45,087.73	₱259,680.64	1,430,316.46	......	1,735,084.83
Maintenance, Alteration and Repair of Public Buildings	199,074.85	81,072.69	......	......	280,147.54
River and Harbor Work, Lights, Buoys and Beacons	895,485.60	7,562.86	21,218.06	₱19,748.08	944,014.60
Artesian Wells and Water Supply	150,693.50	2,307.68	322,419.13	1,715.80	477,136.11
Irrigation Projects	25,717.38	19,771.74	......	847.37	46,336.49
Tres Cruces and Culongculong Dams	......	12,560.41	......	......	12,560.41
Operation of Auto Lines, Quarries and the Supervision of Motor Vehicle Traffic	179,554.07	......	......	......	179,554.07
Miscellaneous	......	93,570.02	415,941.84	11,508.69	521,020.55
Total	1,566,570.47	476,526.04	[a] 8,267,151.60	33,819.94	10,344,068.05

[a] This includes ₱143,934.56 of expenditures originally made by the Bureau but subsequently collected from provinces.

Balance sheet, Bureau of Public Works.

Current assets:		1916.		1917.
Cash (collecting and disbursing officers)		₱52,265.27		₱64,094.09
Supplies and materials		495,754.46		361,010.70
Claims (pending adjustments)		285.71		
Accounts receivable		229,212.10		359,430.76
Investments and securities		400.00		400.00
Prepayments				1,756.33
Fixed assets:				
Real property and improvements [a]		752,278.77		21,837,464.10
Equipment	₱2,100,806.10		₱2,034,242.82	
(Less depreciation)	1,113,297.70		1,152,591.70	
		987,508.40		881,651.12
Total		2,517,704.71		23,505,807.10

Current liabilities:	1916.	1917.
Treasury overdraft	526,679.52	522,345.80
Accounts payable	94,007.89	108,922.59
Accrued leave payable	143,831.40	129,170.93
Deferred credits to income	3,383.47	27,718.31
Surplus:		
Appropriated surplus	10,015.26	(1,465.75)
Principal account surplus (fixed assets)	1,739,787.17	22,719,115.22
Total	2,517,704.71	23,505,807.10

[a] All previously completed Insular improvements taken up under fixed assets.

Statement of appropriations income and expense January 1 to December 31, 1917.

DEBIT.

Reversion of unexpended balance of administrative appropriation	₱56,301.70
Reversion of receipts	926,376.68
Operating expenditures offset by receipts	1,852,811.47
Expenditures administrative appropriation	769,884.05
Outlay purchase of equipment	25,015.26
Balance brought forward to 1918	(1,465.75)
Total	3,628,923.41

CREDIT.

Appropriation for administrative expense of Bureau of Public Works (expenditures partially offset by surcharges collected, Act No. 2672)	₱839,720.00
Balance brought forward from fiscal year 1916	10,015.26
Receipts—Prime cost	1,852,811.47
Receipts—Surcharges	400,049.72
Receipts—Miscellaneous	32,262.24
Gain on supplies sold	1,711.25
Inventory adjustments	3,063.93
Income from rentals	16,580.11
Interest on investment and securities	220.00
Sales of fixed assets	26,619.80
Prior year's credit	20,869.63
Proceeds from loan of gold standard fund	425,000.00
Total	3,628,923.41

Transaction affecting principal account surplus (fixed assets) during 1917,

Principal account surplus, December 31, 1916	₱1,747,767.17
Equipment purchase	25,015.26
Equipment acquired by transfer	3,887.83
Fixed property brought into account	21,137,587.13
Equipment found at station	17,948.21
Total	22,932,205.60

Equipment sold	₱26,241.33
Equipment condemned and dropped	100,219.31
Equipment dropped by transfer	39,440.66
Equipment transferred to supplies	162.53
Equipment issued to jobs	7,732.55
Depreciation written off	39,294.00
Principal account surplus, December 31, 1917	22,719,115.22
Total	22,932,205.60

Operation statement, Bureau of Public Works.

DEBIT.

Operating revenue:	
Rentals	₱16,580.11
Surcharges	400,049.72
Gain on goods sold	1,711.25
Interest on investments and securities	220.00
Inventory adjustments	3,063.93
Other service income	32,264.24
Net loss for the year being aid to local governments	306,887.70
Total	760,776.95

CREDIT.

Operating expense:	
Supervising, technical and clerical service	₱575,956.20
Labor	38,730.92
Consumption of materials	55,458.33
Rental of buildings	13,500.00
Illumination and power service	8,323.14
Traveling expense of personnel	28,677.61
Repair service	22,500.00
Postal, telegraph, telephone and cable service	7,755.31
Other expense	9,875.41
Total	760,776.95

The engineering surcharge was 7⅜ per cent on all public works expenditures.

The larger results of the year's work.

Surfaced road constructed and designated first class	kilometers	299.1
Reinforced concrete bridges and culverts completed (In this figure, concrete pipe culverts are not included)	number	80
Successful deep wells completed	do	108
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	number	47

Expenditures supervised during the year.

Total expenditures	₱10,344,068.05	
Total expended upon road and bridge work	6,148,213.45	[a] 4
Total expended upon building work	2,015,232.37	[b] 1½
Total expended upon port works	944,014.60	[a] 3½
Total expended upon water supply	477,136.11	[b] 25½

Expenditures on miscellaneous items account for the balance.

[a] Per cent of increase over 1916 expenditures.

[b] Per cent of decrease under 1916 expenditures.

ROAD WORK.

Length of road in existence.

	December 31, 1917.	December 31, 1916.
	Kilometers.	*Kilometers.*
First class	3,738.7	3,439.6
Second class	2,056.6	2,045.8
Third class	3,393.6	3,440.7
Total	9,188.9	8,926.1

Relation of first-class road construction and maintenance.

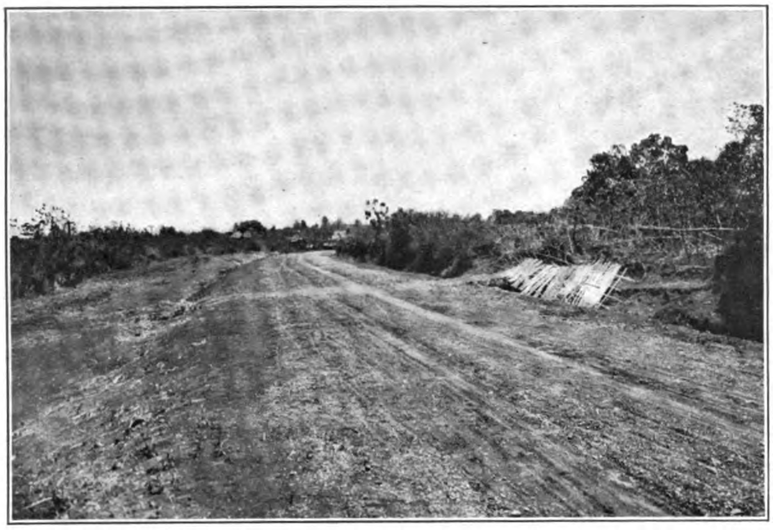
Fiscal year ending—	Designated first-class road at end of year.	First-class road constructed during year.	Average maintained throughout the year by the caminero system.
December 31—	*Kilometers.*	*Kilometers.*	*Kilometers.*
1913	2,171.6	310.4	2,146.3
1914	2,495.5	330.2	2,317.6
1915	3,064.0	499.5	2,732.4
1916	3,436.2	368.5	3,226.8
1917	3,738.7	299.1	3,616.1

The term "designated first-class road" means surface road maintained by the caminero (cantonnier) system under specific agreement between the Insular Government and each separate province.

DEFINITIONS FOR ROAD CLASSIFICATION.

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These

Before construction, San Juan–Mariquina Road, Rizal (at km. 10).



Completed roadbed, awaiting finishing touches, San Juan–Mariquina Road, Rizal (at km. 10).

roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing.

	December 31, 1917.	December 31, 1916.
	Kilometers.	*Kilometers.*
Stone	1,221.0	1,216.8
Gravel	2,657.8	2,455.4
Coral	1,035.5	920.4
Unsurfaced	4,274.6	4,333.5
Total	9,188.9	8,926.1

Goats used as draft animals, Legaspi. Tabaco Road, Albay.

ROAD MAINTENANCE.

Average number of kilometers maintained.

	1916	1917
Caminero system	3,226.8	3,616.1
Gang system	2,800.4	3,057.0
Total	6,027.2	6,673.1

Total cost of road maintenance.

	1916	1917
Caminero system	₱1,642,404.93	₱2,143,887.68
Gang system	472,129.17	560,258.92
Total	2,114,534.10	2,704,146.60

A goat team on Legaspi-Tabaco Road, Albay.

Average cost of maintenance per kilometer per year.

	1916	1917
Caminero system	₱508.98	₱592.87
Gang system	168.51	183.27

The length of road designated first class and the length of road under caminero maintenance are as nearly identical as conditions permit.

The higher cost as compared with the previous year may be attributed partially to increased labor and material costs but largely to the destructive effect on highways of heavy motor traffic and the rapidly increasing number of motor vehicles.

BRIDGES.

Durable bridges and culverts in existence.

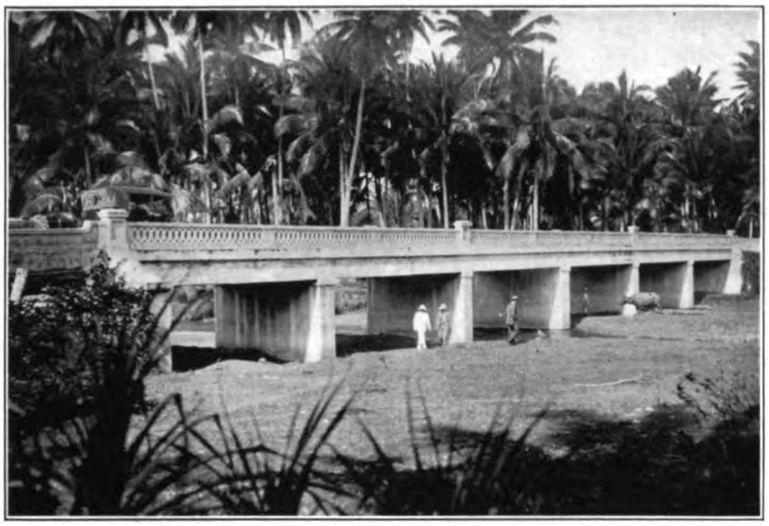
Fiscal year ending—	All durable structures.	
	Total number.	Increase during year.
December 31—		
1913	5,901	
1914	6,206	305
1915	6,640	434
1916	7,156	516
1917	7,370	214

NOTE.—The term "Durable Bridges and Culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The increase in the number of structures is not identical with the number of structures built, not only because with the extension of the work of the Bureau to new territory the old work existing is reported for the first time, but also because of the occasional loss of a struture. The above figures are obtained from semiannual reports of district engineers.

Reinforced concrete structures in existence.

Fiscal year ending—	Total number.	Total meter span.
December 31—		
1913	3,046	11,984
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other classes of construction.



G. Nieva Bridge. Concrete pile foundation, Gasan-Boac Road, Marinduque, Tayabas.

BUILDINGS.

The figures in the tabulation below exclude all structures of less than 100 cubic meters in content.

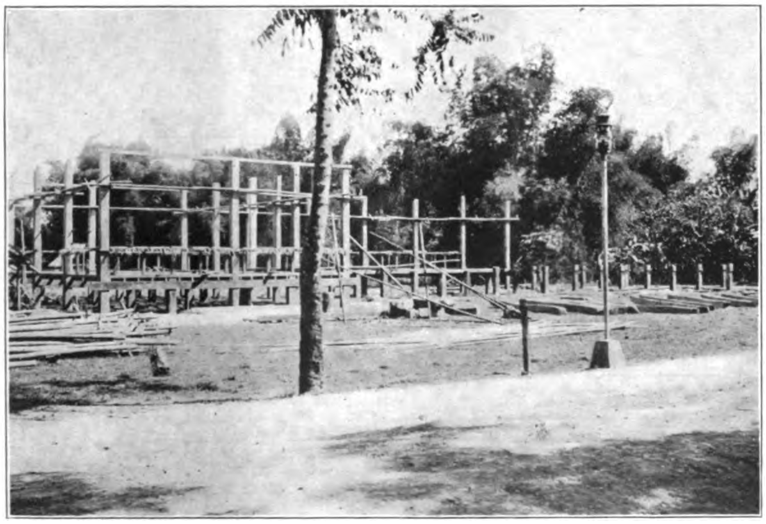
All durable buildings completed.

Fiscal year ending—	Total number.	Total cubic meters.	Reinforced concrete by content.
December 31—			*Per cent.*
1913	123	465,157	89
1914	136	370,723	92
1915	154	522,746	76
1916	112	261,496	85
1917	82	160,888	70

Buildings, in these tabulations, are classified as reinforced concrete when the outside walls, or, in the case of markets, the interior posts, are of that material.

Number of markets and schools completed.

Calendar year.	Markets and tiendas.	Schools.
1913	37	51
1914	51	69
1915	54	72
1916	17	67
1917	15	32



The only wooden school building in Pampanga, under construction at Candaba.

ARTESIAN WELLS.

Successful deep wells driven by fiscal years.

1914	103
1915	139
1916	122
1917	108

A total of 728 artesian wells are now supplying potable water to the inhabitants of the Philippines.

Total expended upon wells, 1917.

	1917		1916	
	Pesos.	Per cent.	Pesos.	Per cent.
Successful wells	199,022.40	90	199,058.80	85
Unsuccessful wells	20,273.40	10	35,646.64	15
Totals	219,295.80	100	234,705.44	100

	1917.	1916.
Average cost of drilling per meter	₱21.33	₱19.73

Summary of deep-well driving, 1917.

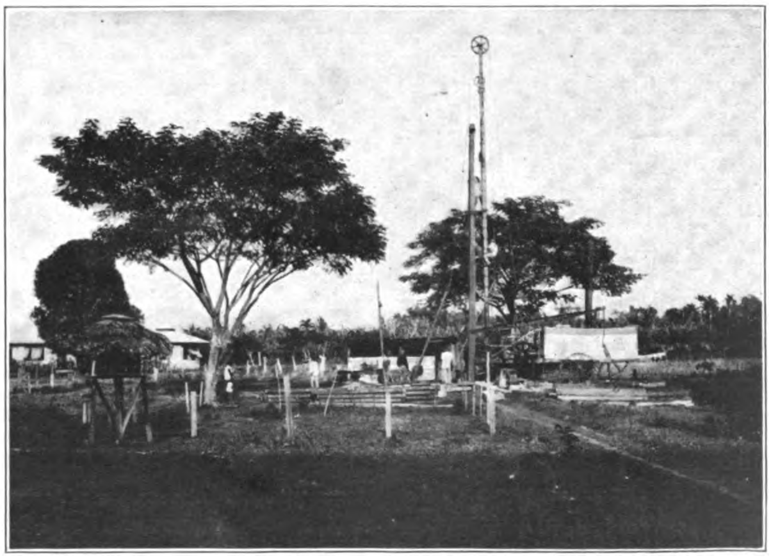
	Number.	Total depth.	Total flow per minute.
		Meters.	*Liters.*
Successful:			
Flowing	36	3651	4069
Pumping	72	5630	6961
Total:			
Successful	108	9281	11030
Unsuccessful	9	978	----------

	1917.	1916.
Percentage of unsuccessful wells drilled	8	10

The new wells completed in 1917 furnish potable water to a population of approximately 150,000.

The average cost of drilling, including pipe supplies, depreciation of equipment and all charges, was ₱21.33 per meter (₱6.51 per foot or $3.25). The increased cost for drilling in 1917 over that for the fiscal year 1916 is due to the increased cost of all labor, supplies and materials used in well construction.

During the early part of 1917 actual drilling was suspended and the personnel of the artesian well division employed on an insular inspection of wells previously drilled. From this inspection, and as a result of instructions issued, increased care on the part of municipal and provincial authorities in the maintenance of pumps and the general sanitary condition of the wells is marked. All flowing wells are now being conserved, their flow having been reduced to 5 gallons per minute. Self-closing spring bibbs are installed on each flowing well in order that the public may at any time secure an adequate supply of water without delay.



Columbia well machine in action at Santa Cruz, Laguna.

Twenty-one drilling machines were operated during the year 1917, and 117 wells were completed, of which only 9 were unsuccessful. The work was delayed somewhat on account of slow shipments of pipe and other materials from the United States, but orders have been placed so far in advance that this contingency should be overcome for 1918.

Experience has demonstrated that there are certain localities where deep-well operations are practically useless, notably on the coast of the China Sea and the Pacific coast of Luzon. In the Ilocano provinces the typical formation is a dark slate shot through and through with pockets and crevices filled with salt water. In the well at Iba, Zambales, salt water was encountered at 380 feet, in a stratum of quicksand, and the rest of the progress was through strata of sand and shale, with salt water always present. In Antique the formation is very similar to that encountered in Ilocos Sur. One well at San Jose was drilled to a depth of 920 feet, but with no prospect of getting below the salt water, and therefore had to be abandoned. On the Pacific coast of Tayabas the drill passed through various strata, with blue slate, conglomerate and volcanic rock predominating. All the wells here had to be abandoned on account of salt water, although at Lopez this was shut off by means of a cement plug at a depth of 65 feet, which places the well in the surface water class.

THE OPERATION AND REGISTRATION OF MOTOR VEHICLES.

The principal taxes imposed on motor vehicles in the Philippines are:

Vehicles.	First ton of capacity.	Each additional 500 kilos.
Trucks with metallic tires	₱50.00	₱4.00
Trucks with rubber tires:		
Passenger	10.00	2.00
Freight	25.00	3.00

Other four-wheel motor vehicles operated for hire, ₱0.20 per horsepower plus ₱20.

Motorcycles of two or three wheels, ₱3.

All other motor vehicles, ₱0.20 per horsepower.

For the fiscal year 1917 motor vehicles were registered as follows:

New registration	1,295
Re-registration	4,729
Total	6,024

Vehicles previously registered and withdrawn from service number 963.

Of the total registration, 1,158 motorcycles and other motor vehicles having less than four wheels are included.

The funds collected during the year under existing law total ₱62,002.90, utilized as follows:

For the maintenance of first-class roads	₱40,000.00
For the payment of salaries, wages and other expenses incurred in the enforcement of the law	18,448.31
Balance	3,554.59

In the licensing of operators 3,022 applicants were examined and 956 new licenses issued. Including renewals 4,891 drivers were licensed to operate motor vehicles.

Attention is again invited to the urgent necessity for amending the present automobile law as it relates to motor trucks. It is important that the use of steel tires for both motor trucks and their trailers be prohibited. Of equal importance is the limitation of the gross load for all motor vehicles, not to exceed 4 metric tons. The inferior grade of surfacing material and the yielding subsoil of the Philippines makes legislation along these lines imperative, as the economic condition of the country does not warrant the greater expenditure for more substantially constructed highways.

In view of the fact that motor vehicles traveling at a speed common for such vehicles do exceptional damage to water-bound macadam surfaces, it is recommended that they be taxed in a measure to offset the extraordinary wear on road surfaces as compared with other vehicles. The present tax of ₱0.20 per horsepower should be increased to not less than ₱1, preferably ₱2, that the rate of taxation may be in keeping with that of other countries.

BUREAU MOTOR TRANSPORTATION

The automobile equipment for the Central Office includes eleven touring cars and runabouts of various makes, and two trucks. These cars are in constant use, being employed not only in the activities of this Bureau but also under regular assignment to the Executive Bureau, the two branches of the Legislature and the Philippine National Guard. A great amount of transportation other than that on regular assignments has been furnished to many branches of the Insular Government. The total operating cost for the Manila Automobile Division was ₱34,822.82. Two-fifths of this amount is properly chargeable to other Bureaus for transportation furnished.

THE BENGUET AUTO LINE

The Benguet Auto Line operated during the past year 6 touring cars, 9 passenger trucks, and 6 freight trucks with 2 trailers. The previously operated motor transportation was supplemented during the year by 5 White passenger trucks. With this increase the capacity of the transportation line was strained to the limit indicating the increasing popularity of Baguio as a health and rest resort. The number of citizens of the Philippine Islands who are utilizing this wonderful health resort is rapidly becoming more and more numerous.

The large increase of agricultural products, including many varieties of fresh vegetables, which are shipped to Manila also created a strong demand for motor transportation over both the Benguet and Naguilian roads. The general activity of the Mountain Provinces with outlets over these two roads are indicated by the subjoined traffic tabulation for the year:

	Motor vehicles.	Other vehicles.	Live stock.	Pedestrians.
Benguet Road	8,432	6,905	715	13,016
Naguilian Road	6,269	18,131	2,576	11,860

The Benguet Auto Line alone handled during 1917, 3,501 first-class passengers, 3,218 third-class passengers, 30,980 kilos of hand baggage, 433,451 kilos of express and freight, and 59,784 kilos of deadhead express and freight.

Benguet Auto Line (Act No. 2187).

[Fiscal year 1917.]

Balance brought forward	₱45,517.76	
Receipts from operation	100,593.60	
		₱146,111.36
Operating expenses	82,147.36	
Purchase of equipment	33,306.53	
		115,453.89
Balance		30,657.47

DIVISION OF ARCHITECTURE.

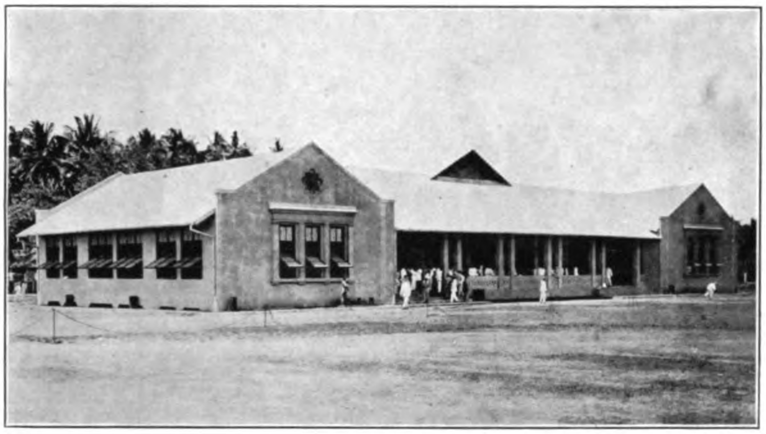
RALPH HARRINGTON DOANE, Consulting Architect.

The report for the year 1916 pointed out the divergence between the architectural taste of the Filipino people and the extremely plain and severe buildings constructed by the Government in the past and set forth the desirability of producing in this Archipelago an architecture commensurate with the luxuriousness of the tropics and expressive of the native desire for embellishment and color in public edifices. This thesis which was the result of experience in 1916 has been translated during 1917 into a working policy and has resulted in architectural structures more pretentious and imposing than ever previously accomplished in the Philippines. Such progress as this has been made possible by increased appropriations over previous years and by increased interest in the construction of dignified government edifices.

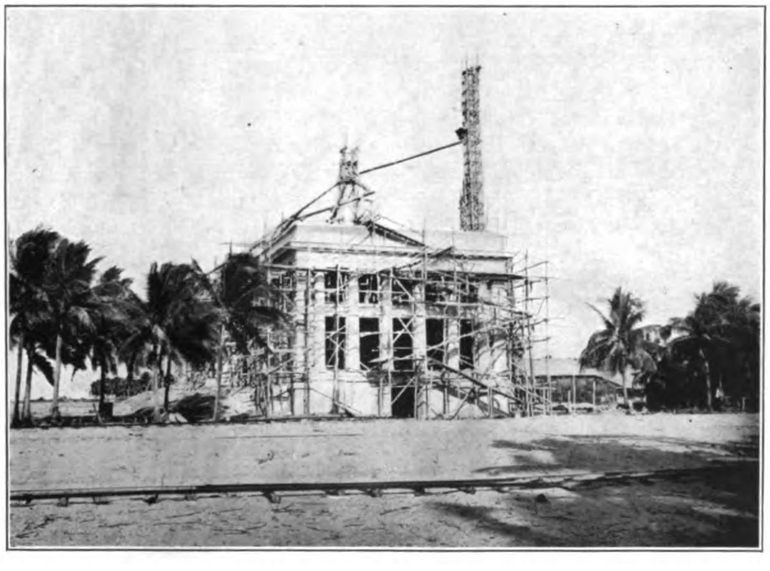
War conditions have prohibited the importation of certain architectural specialties and caused a demand for their local manufacture, which has been a decided stimulus to architectural craftsmen. For example, carved wood and wrought iron electric fixtures are being successfully made in Manila, and drawings of this division have recently called for the manufacture locally of wrought-iron hardware.

Alterations at the Malacañang Palace have constituted one of the most important and difficult problems of this divison during 1917.

Lingayen Capitol Building under construction showing general front view.



Zamboanga high school, Zamboanga.



Lingayen Capitol Building, south wing.

The new work, although consistent with present architectural standards, is harmonious with the existing old Spanish work, which together with traditions make the residence of the Governor-General a most important architectural monument in these Islands.

Major building projects actually under construction during 1917 are the following:

1. Alterations of Malacañang Palace, Manila.
2. Pangasinan Capitol Building, Lingayen.
3. Leyte Capitol Building, Tacloban.
4. Ilocos Norte Capitol Building, Lawag.
5. Zamboanga Normal School, Zamboanga.
6. San Lazaro Insane Ward, Manila.
7. Burawen Presidencia, Burawen, Leyte.
8. Daet Presidencia, Daet, Ambos Camarines.
9. Jones Bridge, Manila.
10. Architectural headhouses and wharf buildings, Manila.

These ten major projects alone involve an expenditure of about ₱4,000,000.

In addition to the above enumerated projects, plans and specifications have been supplied for numerous municipal buildings, markets, hospitals, dormitories, schools, bodegas, etc., and a decided effort has been made to devise an economical and artistic system of construction for some of these less important and smaller projects.

DESIGNING DIVISION.

C. E. Gordon, Chief Designing Engineer.

The designing division has been greatly handicapped in its choice of materials because of the entrance of the United States into the war. Temporary timber structures, in consequence of the handicapping conditions, are being constructed to a considerable extent. Generally, the ultimate cost of the temporary structures will be less with the present price of permanent materials than if the permanent types were constructed. Because some of the materials cannot be obtained from the manufacturers, all waterworks construction is confined to the use of expensive cast, and galvanized iron pipe. The handicapping conditions of 1916 were very considerable, but with the entrance of the United States into the War in April, with the concomitant mobilization of industrial America for war, obtainment of pumping machinery, engines, electrical supplies, reinforcing steel, and water pipe has been greatly delayed forcing rearrangement and substitution on many projects.

Fountain at Boac, Marinduque, Tayabas (Gregorio Nieva water works).

In waterworks development detailed and final plans were prepared for Lucena, Tayabas; Tayabas, Tayabas; Pagsanhan, Laguna; Hagonoy, Bulacan; Naga, Cebu; Pilar, Cebu; Barili, Cebu; Dauis, Bohol; San Jose, Antique; Mendez Nuñez, Cavite; and Cuenca, Batangas.

Preliminary plans and estimates were prepared for water supply projects as follows: Jagna, Bohol; Tubigon, Bohol; Silang, Cavite; Nagcarlang, Laguna; Batangas, Batangas; Carmen, Bohol; Balingasag, Misamis; Bacon, Sorsogon; Gigaquit, Surigao; Placer, Surigao; Surigao, Surigao; and Bay, Laguna.

Studies have been made of the proposed water supply project of Iloilo and comparative estimates prepared of the cost of a filtration plant and a low-pressure concrete pipe leading to a supply reservoir.

In the activity of water rights determination there were 160 applications for water rights, and 297 statements of existing water rights filed. In addition to the aforestated number of statements there were a very large number submitted relative to adjudication proceedings.

Several established irrigation systems have been adjudicated and certificates of title issued, namely:

Bitucang Manoc, Province of Pampanga.
Patalac Creek, Province of Nueva Ecija.
Orani River, Province of Bataan.
Dibulo Estero, Province of Nueva Ecija.
Balasiwak Estero, Province of Nueva Ecija.
Bangad Estero, Province of Nueva Ecija.

Surveys and other field activities have been completed, and more or less consultation with the irrigators have been accomplished, upon the following:

Dibabuyan Estero, Province of Nueva Ecija.
San Juan River, Province of Nueva Ecija.
Baliuag River, Provinces of Nueva Ecija and Tarlac.
Maasim River, Provinces of Bulacan and Pampanga.
Taguan River, Province of Tayabas.
Cabatuan Estero, Province of Nueva Ecija.
Calaguiman River, Province of Bataan.

Field surveys are now under way upon the following adjudication cases:

Bued River, Provinces of Pangasinan and La Union.
Parasapas Creek, Province of Pangasinan.
Pansol Creek, Province of Bataan.
Talisay River, Province of Bataan.
Nagsincaoan River, Province of Ilocos Sur.
Ubbog Estero, Province of Ilocos Sur.

The area of the land directly affected by the proceedings now under way is, approximately 60,000 hectares, having a valuation of approximately ₱18,000,000. Five survey parties have been, and are, employed upon the adjudication cases.

Because of lack of funds no hydrographic data was obtained during the year.

In the annual report for 1916, references were made to the overflow type of concrete bridge. Those already constructed have been a success. Because of this success, a still further development has been accomplished by substituting timber spans for the ordinary low-water opening under conditions warranting temporary construction. This type can usually be placed in locations where the timber collapsible bridge has been formerly so economically used, and it does not possess the disadvantage of requiring replacements of the superstructure after every flood as is the case of the latter.

Further progress has been made in completing a set of standard timber truss spans along the line of improvements inaugurated last year, wherein particular attention has been given to the use of first group native timber and rigid connections. Although the cost of these timber trusses exceeds that of previous design, the excess is justified in as much as the life of the new trusses will be from eight to twelve years and more with regular inspection and maintenance.

Plans have been prepared for some 340 lineal meters of temporary bridges, 250 lineal meters of concrete low-grade bridges, 930 lineal meters of reinforce concrete bridges, in addition to over twenty plans for wharves, river protection, and miscellaneous jobs. Because of the widely varying prices of materials within comparatively short periods, estimates of cost have not been made except for comparison of types, or of contractor's proposals, because little dependence could be placed upon such estimates if much time elapsed before construction were undertaken.

In the field of electrical and mechanical engineering an increasing importance has been clearly manifested. Plans and specifications, and for some of the buildings, bills of materials for electric lighting, telephone and call-bell service for fourteen proposed Government buildings were prepared. Studies relative to the proposed hydro-electric plant at Zamboanga were completed, preliminary plans were prepared, and with the close of the year the final plans were ready to be drawn. With the completion of the final plans, the specifications, and bills of material, this project may be actually begun.

The installation of the power units and electric ligthing system of Taal, Batangas, were supervised. Also, the installation of a Diesel Engine plant in the Manila Trade School was supervised, tested, and reported on.

Engineering and operating cost studies were rendered upon the proposed pumping plants for Antique, Batangas, Iloilo, Cavite, and Laguna.

Several installations of pumps have been supervised, and comments and advice have been given upon proposed changes in pump units.

CONSTRUCTING DIVISION.

D. E. Henry, Chief Constructing Engineer.
W. C. West, Acting Chief Constructing Engineer.

HIGHWAY CONSTRUCTION.

First-class road work was carried on in every province in the Islands, and most of them declared some additional first-class ~~road~~; Cebu leading with 45.9 kilometers, Occidental Negros a close second with 41.7 kilometers, and Pampanga and Iloilo following with 30.3 kilometers and 23.7 kilometers respectively.

Arayat-Cabiao Road, Pampanga (under construction).

The tendency toward the nationalization of the road system was very apparent, in that most of the important construction projects were either interprovincial roads or development highways for outlying provincial districts. Considerable progress was made on the Iloilo–Antique Interprovincial Road, principally on the Antique side, where the subgrade has been completed from Guintas, the junction with the Antique first-class system, practically to the provincial boundary. The Iloilo portion proved more difficult to locate, but the location has now been made and the work is being pushed rapidly. With the ₱75,000 provided in 1918 for this road, Antique's isolation is in a fair way to be broken up and the factor responsible for the slow development of the province thus eliminated.

The grading has been completed on the Lubao–Hermosa Interprovincial Road between Pampanga and Bataan, all necessary bridges and culverts are in, and the surfacing is being placed and rolled. The road passess through high-class farming lands and opens up the province of Bataan to wheeled traffic from Manila and the near-by

Camineros assembled at San Fernando, Pampanga.

provinces. It also connects with the proposed road to Zambales province through Dinalupihan.

The Noveleta–Cavite Road was completed during the year; length 9.4 kilometers, cost ₱98,471.86. The high unit cost (no bridges) is due to the construction methods made necessary by the swamp location. Parallel dikes of adobe and mud were built under the shoulders of the road, and the space between was filled with beach sand. The trip from Manila to Cavite is now made comfortably by automobile.

About ₱90,000 were expended on the Sambat–Nagcarlang Road in Laguna Province, and with the balance left in the appropriation the road will be opened for traffic not later than April 15, 1918. A small isolated first-class road system has been built up around Santa Cruz, the provincial capital, and this road will connect the system with the Manila–South Road at San Pablo. Noticeable features of the work are the grade reductions at Lilio and Nagcarlang and a ridge location several kilometers in length that is almost a single tangent.

The subgrade and nearly all the culverts have been completed on the Camp One–Aringay Road in La Union, and the road was opened to dry-season traffic in December. The Manila–North Road may now rightly claim that title, for it is open from Manila to Banguí, nearly 600 kilometers. An allotment of ₱75,000 for this project will be recommended for 1918, to be expended on surfacing.

The Tagudin–Cervantes Road is the most important project in the Mountain Province. The 1917 appropriation was ₱86,000, of which ₱70,000 were expended during the year, and an additional sum will be requested for 1918. The work consists of widening the old trail to a minimum width of three meters, reducing curvature and grades. The grading is completed on about 25 kilometers of the Tagudin end and the section is open to motor traffic during the dry season, pending the construction of a bridge over the Kimpusa river at kilometer 18. The sub-provinces of Amburayan, Lepanto, Bontoc and Kalinga are assured of an outlet in this road, the importance of which can hardly be overestimated. The route is also superb from a scenic view point.

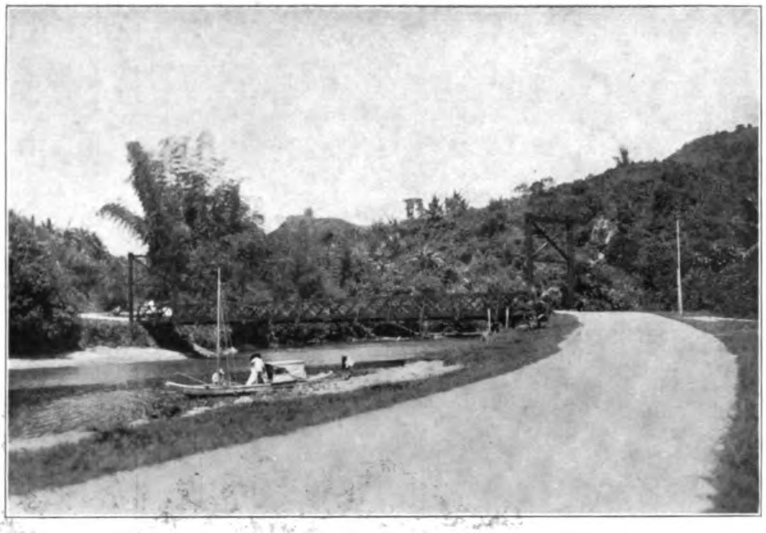
A route for the Nueva Ecija–Nueva Vizcaya Road was first investigated in July, 1916, with the result that the location passing through San Jose and Puncan, Nueva Ecija, and Baliti Pass and Santa Fé, Nueva Vizcaya, was chosen. The pass is some 200 meters lower than the old Spanish trail over the Caraballos Pass above Carranglan, and more than 700 meters lower than the Padre Villaverde Trail from Pangasinan. An allotment of ₱100,000 was released in March, 1917, and the grading has been completed from San Jose to where the road enters the canyon of the Talavera River, about 5 kilometers. Most of the controlling points of the entire location have been decided upon, so that there should be no difficulty in keeping the detailed surveys ahead of the construction gang.

In Occidental Negros two rather important construction projects have been completed: Bacolod–Murcia, 13.0 kilometers, cost ₱26,281.03; and Pontevedra–Bagunawa, 7.0 kilometers, cost ₱23,934.93. The first named gives an inland town an outlet to the coast and the capital, and the second is a detour in the Bacolod–South Road to avoid a dangerous river crossing too wide to bridge at any reasonable cost.

A location survey for the Albay–Sorsogon Interprovincial Road was made in 1913, and the road was estimated to cost ₱537,152.19. A special allotment of ₱50,000 was released in July, 1917 to start the work with, and 5 kilometers of the Sorsogon end were at once placed under contract. The contractor has completed his grading and has placed broken stone on the right-of-way for surfacing the first 3 kilometers. The grading on 3 additional kilometers has been completed under the paquiao system. The country through which the road passes is very fertile but largely undeveloped, hence the commercial opportunity that awaits the road when it is completed.

BRIDGES.

Batangas Province was able to build two permanent arched structures notwithstanding the high cost of materials. These were the Dayapan and Paninsiñgin Bridges, single arches of 16 and 18 meter spans respectively. The arch rings, footings, and balustrades are of reinforced concrete, while all spandrel and abutment walls are of adobe stone. The two bridges cost ₱47,416.15.



Maulong suspension bridge, near Catbalogan, Samar.

The Bagbag Bridge, Bulacan Province, is a typical reinforced concrete deck girder structure on concrete pile bents, made up of nine 9-meter spans, and with its deck 5.05 meters above low water. It spans the Bagbag River representing a connecting channel between two other rivers, and whose current flows either way depending on the relative heights of the parent streams.

The Baroro Bridge, La Union Province, was the most important bridge project of the year, and is also the longest concrete structure in the Philippine Islands. It is another typical slab and girder structure on reinforced concrete pile bents, and consists of twenty-two 9-meter spans, or a total span of 198 meters. Construction by administration was authorized on May 8th, and the bridge was completed December 14th. Cost complete, ₱71,508.33, including surcharges and approaches.

Erection of the steel for the Camiling Bridge, Tarlac Province, was commenced in October, 1917, after the danger from high floods was past. This is a pin-connected Pratt truss, two 150-foot spans, 14-foot roadway, ipil floor. The work was done by administration.

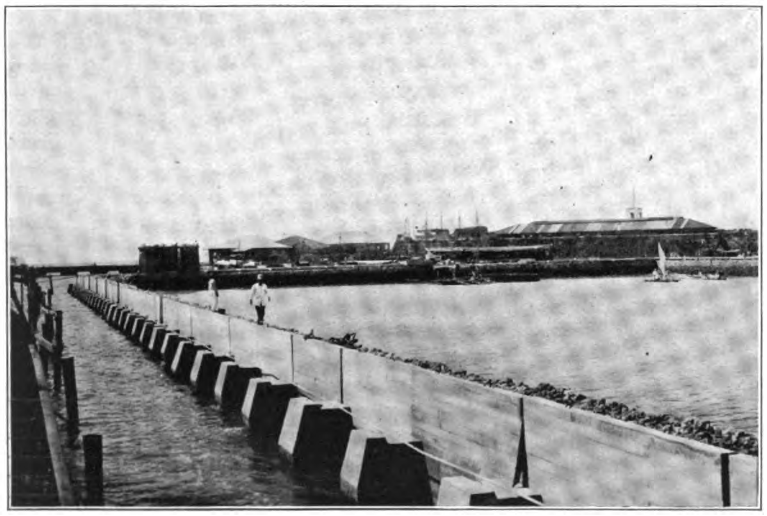
A few examples of concrete fords were built during the year, at the crossings of torrential streams. A boulder fill extending entirely across the river is covered, both on top and on the slopes, with a concrete slab, carried down into the river bed on each side as curtain walls to prevent scour. The roadway is usually placed not more than 60 centimeters above the stream bed, and the dry-weather flow, if any, is accommodated by means of reinforced concrete pipes passing through the embankment.

PORT WORKS.

The phenomenal increase in the overseas trade of the Philippine Islands as well as the domestic trade emphasizes the necessity for a wide extension in the port works development plans. The economical

View of bulkhead showing cargo shed location. Construction work inaugurated, Manila.

Hermosa hurdles at Bayambang, Pangasinan.



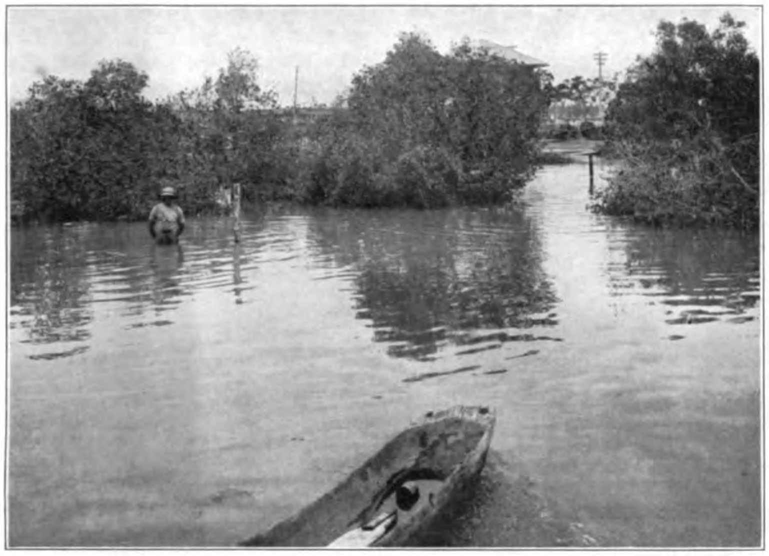
General view of back piers showing the basin to be filled, Cebu Wharf.

condition of the Philippine Islands warrants the belief that the present production capacities are natural. Increased tonnage in the Philippine merchant marine is assured and ocean carriers are increasingly demanding dock facilities in the producing centers. Greatly improved facilities for loading and discharging are now available in Manila, Cebu, Iloilo, and Zamboanga for the larger steamers of the world's merchant marine and the improved facilities at Tacloban, Leyte; Surigao, Surigao; Calbayog, Samar; Cagayan, Misamis; Coron, Palawan; and Tagbilaran, Bohol are either completed or actively under construction. The general internal development of the Philippine Islands will warrant energetic activities along the lines of improved harbor facilities in many ports of call of inter-island freight carriers.

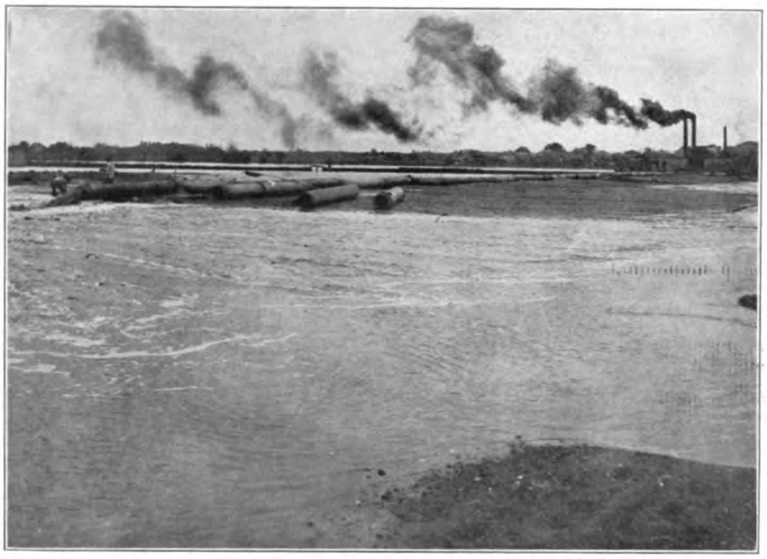
Tagbilaran, Bohol.—The harbor of Tagbilaran, Bohol Province, is being improved by blasting a channel through the outer reef and constructing seven standard acetylene beacons so located as to mark a channel up the bay to the proposed wharf. The beacons are completed, and the excavation of the reef is 37 per cent completed.

Cebu.—The new wharf extension in Cebu consists of a concrete dock or quay 417 meters long with a depth of water from 20 to 22 feet. The wharf is being constructed something like 200 meters offshore with an approach road, buit on a coral fill, connecting with the shore at each end. The area included between the wharf and the old beach is to be reclaimed by dredging and filling and will be available for commercial use. This will give about 9½ hectares of reclaimed land, of which 5½ hectares will be for sale and 4 hectares for use as streets and sidewalks. The original estimated cost of the project was ₱650,000, but the increased cost of materials and the scarcity of labor may run the cost up to as much as ₱700,000. All the items necessary to finish the job are included: Wharf, dredging, fill, streets, curbs, sidewalks, and storm sewers.

Cebu wharf improvement dredging along front line. Dredger shown discharging silt into inner basin.



An illustration of the lowlands of Iloilo, before filling.



Dredge at work filling St. Paul's Hospital grounds, Iloilo.

Land on the reclaimed area is readily worth ₱30 per square meter and there will be no trouble in leasing this new section on a valuation basis of ₱20. This will make the value of the land for sale about ₱1,100,000 gaining the Government a profit of about ₱400,000 as well as a free wharf and street system. There have been many inquiries already regarding the sale of this area and it will be an easy matter to dispose of the whole section at the estimated figure.

The expenditures to date may be subdivided as follows:

Equipment	₱39,595.45
Coral rock fill (Contract) 57,000 cubic meters	44,916.37
Material (Cement, piling lumber, etc.)	62,163.35
Labor and supervision	51,045.17
Surcharges	29,459.36
Miscellaneous	7,724.75
Total	234,904.45

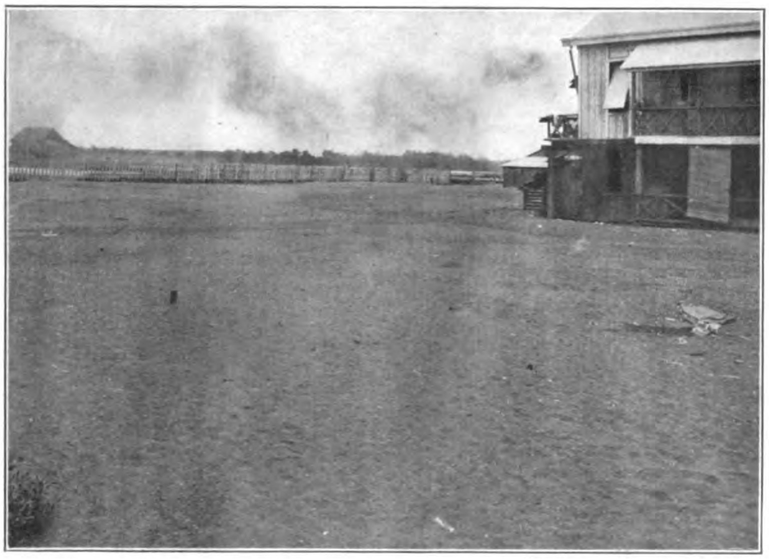
The work completed consists of the pier and back slabs with a little more than 50,000 cubic meters of coral rock fill.

Iloilo.—Bureau of Public Works Dredge No. 3, a 15-inch suction dredge, arrived at Iloilo in April, started work in the vicinity of the Forbes Bridge, and during the year approximately 170,000 cubic meters of dredged material deposited on the lowlands of the city of Iloilo. The La Paz market site, formerly a fishpond, was filled in to an average height of something over a meter, converting it into a well-drained site for a modern market, which has since been built. A large amount of filling, by special contracts was also done for private parties along the banks of the river, and the value of the land thus reclaimed has increased tremendously. In the month of August the dredge dropped down to the mouth of the river and dredged the bar at that point. Owing to the fact that the ladder is but 23 feet 4 inches long, it was necessary to work only at low tide, the approved elevation of the river bed being from 20 to 24 feet below mean low water. The spoil was wasted in Guimaras Strait on either side of the mouth of the river, except for a small fill which was made on the property controlled by the Federal Government adjacent to the United States military dock.

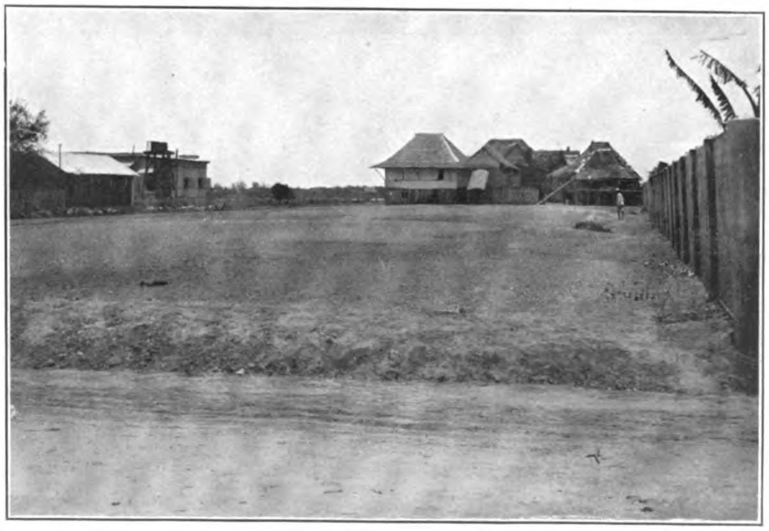
Moving up the river again in October, three pieces of property with a river frontage of 134 meters were filled to a depth of 50 centimeters; and 14,365 cubic meters were deposited on the Lapus school lot.

On December 24th the dredge was moved above the Forbes Bridge and work started on filling the Assumption College property, a 20,000-cubic meter project. Further work is expected throughout such lowlands in the Nipa District of Iloilo as can be reached by pipe lines from the river. It is also proposed to cut off the point opposite the new customhouse in order to provide a turning basin large enough for any vessel that comes into the Iloilo River. The problem at present for large vessels is not so much for depth as for turning space.

In connection with the river dredging, a number of pieces of riprap wall have been placed by the property owners along the bank of the river, which give the frontage a decidedly better appearance.



Completed fill, Calle A. Bonifacio, Iloilo.



Fill completed near Assumption College, Iloilo.

Filling St. Paul's Hospital grounds, Iloilo.

Tacloban Wharf, with coral back fill, Leyte. (showing basin to be filled by hydraulic dredge).

The old Spanish river wall in front of the new customhouse, the only break in a continuous reinforced concrete wharf extending from Inchausti's bodegas to the foot of Calle Tres Reyes, is being replaced by a new concrete wharf.

The Molo Jetty, built in 1914 and 1915, continues to aid in the formation of large accretions along the foreshore. The work has been so successful that a number of similar jetties are contemplated for the year 1918.

Boac, Marinduque.—Three standard wooden pile hurdles have been placed at Boac, Marinduque, to prevent the river at that place from encroaching further upon the exposed business section of the town. The investigations showed that any attempt to prevent flooding of the lower town at high-water stages would prove extremely costly, so that the plans contemplated only works to prevent further scour. The wooden pile hurdle, used so extensively on the Mississippi River and its branches, was selected as the most suitable type for the purpose. These hurdles have been tested by floods since their construction and have performed satisfactorily. Permanently good results can be reasonably expected. The cost of the completed work was ₱11,084.68.

Tacloban, Leyte.—An appropriation of ₱77,500 was made for the Tacloban Wharf in 1916 and another of ₱75,000 in 1917, making a total of ₱152,500.

The harbor of Tacloban is one of the best natural harbors in the Philippines. The name, Tacloban, is taken from the Visayan word "Taclob" meaning "to cover," and this is a very apt description of the harbor. Plans for a public wharf were prepared by the Bureau of Public Works early in 1916, contemplating a concrete wharf 100 meters in length and 7.75 meters wide and about 63 meters from the shore line.

On June 20, 1916, the contract was awarded to Wm. Anderson, the lowest bidder, this contract being later added to and extended. Mr. Anderson started actual construction on July 1, 1916. It was estimated that about 10,000 cubic meters of rock at ₱2.15 per cubic meter would be needed for the fill, but on account of the depth of the mud it actually required 41,105 cubic meters. The work as described was completed in October, 1917.

Calbayog Jetty, Samar.—The Calbayog Jetty is designed as a stone breakwater built practically at right angles to the shore with an elevation of 2.5 meters above lower low water. All facing stones are of large size, weighing from 200 to 1,000 kilograms each.

This jetty is constructed with the idea of protecting the mouth of the river against a sand-bar formation, the sand being carried by the wave action during the northeast monsoon. After the completion of the jetty a channel will be dredged through this bar parallel to the jetty construction, and it is hoped that the current of the river will keep the channel open so that launches and cargo boats can get in during all stages of the tide. About 120 lineal meters of the jetty were constructed in 1916, and 140 lineal meters in 1917, involving an expenditure of ₱32,360.36 out of an appropriation of ₱55,000.

Zamboanga.—The reinforced concrete piles for the Zamboanga port-works construction, 125 in number, were cast during 1916. The driving of the piles was started in March of this year. The unusual

Boac hurdle, Marinduque, Tayabas.

Binondo estero at the time improvements were undertaken.

feature of the job was the design and construction of a very heavy tilting pile driver, allowing the top of the leads to be inclined outwards so that batter piles could be driven along the outer edge of the dock from falsework. The superstructure is of reinforced concrete, 12 by 63 meters in plan, and with a fender system composed of Montelince piles and heavy fender springs. On December 31, 1917 all the piles were in place and approximately 75 per cent of the superstructure completed.

LIGHT HOUSE CONSTRUCTION.

A steel tower 60 feet high for an automatic acetylene flashing light was built at Pearl Bank, Sulu; another 90 feet high at Suluag, Sulu; and a third 50 feet high at Little Santa Cruz, Zamboanga. Standard concrete beacon towers for automatic flashing acetylene lights, each tower about 30 feet high, were built at Balanacan, Marinduque; Santa Cruz, Marinduque; Balayan, Batangas; Calantas Rock, Sorsogon, and Silanga Pass, Tayabas. Repairs and alterations of considerable extent were made on fifteen lighthouses in various parts of the Archipelago, and minor repairs on a number of others.

DREDGING.

Dredging operations were carried on during 1917 in Manila Harbor, Pasig River, Manila Esteros, Iloilo River, and Cebu Harbor. About 32,000 cubic meters of dredged material at Manila has been utilized to make fills on lowland, private and insular property in Manila. An amount of ₱6,072.79 has been collected for the dredged material deposited on private property.

The Bureau owns and operates seven dredges of different capacities including the sea going S. S. Dredger.

The following tabulation is a detailed statement of the dredging work done in 1917.

Dredging operation.

Locality.	Total from 1902 to 1916.	Fiscal year 1917.	Total.
	Cu. m.	*Cu. m.*	*Cu. m.*
Lower Pasig River	5,712,033	200,694	5,912,727
Outer Harbor	1,775,218	468,513	2,243,731
Upper Pasig River	663,826	3,426	667,252
Inner Basin	360,212	35,218	395,430
Binondo Estero	52,816		52,816
Estero de la Reyna	232,308	614	232,922
Paco Estero	17,200	240	17,440
San Miguel Estero	50,952	5,254	56,206
Proviso Estero	21,148	6,596	27,744
Marine Railroad Engineering Island	30,865		30,865
Talim Island (city)	1,071		1,071
Outer Bar	463,701	71,000	534,701
San Sebastian Estero	3,556		3,556
Magdalena Estero	7,098	9,482	16,580
Engineering Island Canal	30,180		30,180
Vitas Estero	240,827		240,827
Quiapo Estero	5,723	6,784	12,507
Cegado Estero	35,509		35,509
Pandacan Estero	172		172
Estero de San Lazaro	22,975		22,975
Corregidor Bay Quartermaster	54,956		54,956
Iloilo River	1,357,824	169,250	1,527,074
Cebu Harbor	154,084	21,900	175,984
Mariquina River	7,290		7,290
Balete Estero	14,849	6,797	21,646
District of Cavite	20,876		20,876
Tondo Beach		8,000	8,000
Santibañez Estero		19,762	19,762
Total	11,337,269	1,033,530	12,370,799

WATERWORKS CONSTRUCTION.

Duero waterworks, Bohol.—This is a gravity project completed during the first part of the year. The main pipe line is 1,716 meters long and the head available is 220 meters. This water system proved to be the only effective means of stamping out the cholera in Duero. Total cost, ₱8,906.95.

Loay water-works, Bohol.—This is a gravity system the source of which is a spring with a flow of 130 gallons per minute. The length of the main pipe line, 3-inch Matheson steel pipe, is 7,200 meters, and the available head is 426 feet.

The materials for this project were requisitioned on December 22, 1915, and were received July 9, 1917. This delay was due to war conditions. Progress of the work was very slow due to lack of laborers.

Binondo estero wall, recently completed. The City of Manila has obligated itself to improve the Street.

Zamboanga waterworks.—The construction of the Zamboanga Waterworks System was begun in 1915, and as constructed and now in successful operation, carries sufficient water from the intake to the reservoir to provide for the subsequent installation of a hydro-electric plant near the present reservoir. The principal features of the system are the headworks, comprising the intake and the settling basin; 2,293 lineal meters (7,524 feet) of reinforced-concrete pressure

Arangasa light station under construction, Surigao.

pipe; 810 lineal meters (2,657 feet) of tunnels; a 2,275,000 liter (600,000 gallon) reservoir; and the distribution system, including 4.8 kilometers (3 miles) of 40, 30, 25, and 20 centimeter (16, 12, 10, and 8 inch respectively) cast-iron pipe leading from the reservoir to the city. The intake is located on the Tumaga River at a point 8 kilometers (5 miles) from the city and at an elevation of 63 meters (207 feet) above mean low tide. If found necessary, the watershed will be patrolled, which will insure an unpolluted supply of water.

At the intake the water is taken from a natural rock pool in the river and flows through trash racks into a rectangular concrete box, constructed in solid rock excavation, and reinforced with steel rails embedded in the concrete. From the intake the water passes through 91.4 lineal meters (300 feet) of 91-centimeter (36-inch) square reinforced-concrete pipe to the settling basin, which is a semicircular concrete-lined reservoir 32 by 52 meters (105 by 170 feet) in plan, supplied with baffle walls between which the water flows in a circuitous route. The inlet pipe feeds into a rectangular concrete gate box from which three gates open: one into the settling basin; one into the concrete drain pipe leading to the river, and one into the main pipe line to the distribution reservoir. Ordinarily, the water passes from the upper gate box directly into the settling basin and then into the main pipe line at the lower gate box. By manipulation of the upper gates, however, the water can be turned directly into the drain for flushing it, or into the main pipe line to allow the settling basin to be unwatered for cleaning and repairs.

From the settling basin the water is carried through a 442-meter (1,450 feet) of 76 by 91 centimeter (30 by 36 inch) rectangular concrete pipe, 1,760 meters (5,774 feet) of 76-centimeter (30-inch) diameter circular concrete pipe, and 810 meters (2,657 feet) of tunnels to the distribution reservoir. Rectangular pipe was used principally for economic reasons, as in a deep cut a much wider trench is required to remove circular outside forms than the vertical ones of the rectangular pipe. No expansion joints were used, but wherever the pipe is located on an appreciable grade, large concrete anchor blocks were cast at intervals around the pipe to prevent crawling or settlement. Baffle walls were cast around the pipe in those sections subject to overflow, to prevent water from following along the outside of the pipe. At one stream crossing the pipe was protected with a reinforced concrete apron. Thirteen manholes were built in the line, each provided with a 2-centimeter (¾-inch) air valve, and two additional air valves at breaks in the grade, also two 10-centimeter (4-inch) blow-off valves and four 18-centimeter (7-inch) riser pipes.

There are four tunnels of 208, 34, 88, and 481 meters (682, 110, 288, and 1,577 feet), respectively. The excavation was started with a 107 by 122 centimeter (3½ by 4 foot) section, but it soon developed that better progress could be made by increasing the height to 152 centimeters (5 feet). One vertical shaft and two inclined side drifts were driven on the longest tunnel and one vertical shaft on the 208-meter (682-foot) tunnel, totaling in all 88 lineal meters (290 feet). All the tunnel excavation with the exception of 46 meters (150 feet) is in a conglomerate rock varying in hardness from a soft, easily picked material to a cemented rock of such hardness that all progress had to be made by blasting. The soft material caused considerable trouble from cave-ins, and it became necessary to timber this section, but this was practically the only timbering used. After a three-month trial with local labor, it was found advisable to import experienced Igorot laborers.

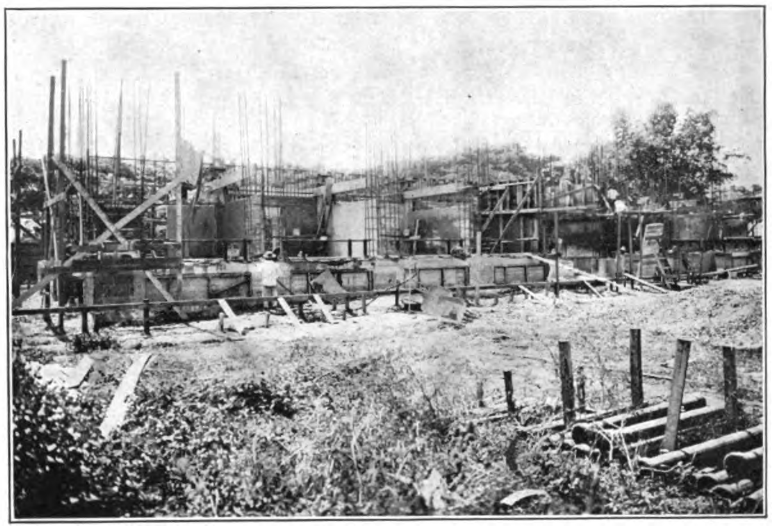
Accurate cost data kept on the longest and most costly tunnel gives a total average cost of ₱17.17 per meter ($2.62 per foot) for excavation, exclusive of 75 meters (246 feet) of shafts and side drifts. Shafts and drifts required for this with these added, the total unit cost was ₱19.64 per lineal meter ($3.00 per lineal foot) of tunnel proper. These figures include all lights, explosives, and supervision. The shorter tunnels were excavated at a lower unit cost.

The pressure line discharges through a 61-centimeter (24-inch) valve directly into the distribution reservoir, which has a capacity of 2,275,000 liters (600,000 gallons), and with the exception of a portion of one side, is constructed entirely in excavation. The reservoir is 30 by 36 meters (98 by 118 feet) at the top, with inside slopes of 1½ to 1. The bottom elevation is 48.5 meters (159 feet) above mean low tide and the normal elevation of the water level is 51.5 meters (169 feet), which can be increased an additional 61 centimeters (two feet) by means of flash boards on the reservoir overflow. The reinforced concrete lining was laid in sections, and without expansion joints, but reinforcing bars are continuous from one section to the next. A by-pass of 40-centimeter (16-inch) cast-iron pipe allows the reservoir to be cut out for cleaning and repairs. The water enters the pipe line to the city through wire screens of 1 centimeter (⅜-inch) mesh. From the reservoir 5,242 lineal meters (17,200 feet) of 40, 30, 25, and 20 centimeter (16, 12, 10, and 8 inch, respectively) cast-iron pipe carry the water along the Santa Maria Road to the city.

Fifty-four 10-centimeter (4-inch) standard hydrants manufactured by the Eddy Valve Company have been installed for fire purposes, and as the hydrants are spaced unusually close together and the system is capable of throwing four fire streams to a height of 14 meters (45 feet), the city is provided with very good fire protection. Five public fountains are supplied by the system, but only one free service tap has been installed, at the public market. About 350 house connections have been installed, most of which are metered.

The total cost of the completed waterworks system is as follows:

Materials	₱173,300.14
Labor and supervision	96,699.47
Miscellaneous	5,888.77
Surcharges	29,672.92
Total	305,561.30



Insane ward under construction, San Lazaro Hospital, Manila.

Of this total cost, ₱85,000 is apportioned to the cost of increasing the size of the pressure pipe to carry sufficient water for the future hydro-electric plant, the detailed plans of which are now very nearly completed. Funds for its installation are assured, and construction will be started as soon as materials can be obtained from the United States.

BUILDINGS.

The Daet Municipal Building, Province of Ambos Camarines, was 95 per cent completed on December 31, the appropriation being ₱35,626.58. It is a two-story reinforced concrete structure, 9.70 meters by 20.70 meters in plan, both floors of concrete, and with a roof of flat galvanized iron. Noticeable features of the design are the ornate marquise over the front entrance doors, a wide lobby, a second floor with no fixed partitions, and a bungalow roof with but slight pitch and 1.50 meters overhang at the eaves.

For the Aguinaldo (Kawit) School, Cavite Province, the Bureau of Education Standard Plan No. 10 was modified to the extent of providing a roof of cement tiles, windows open to the floor and outside walls carried down to continuous footings. The cost was ₱29,099.34, only about ₱5,500 more than the unmodified standard plan would have cost.

The Iloilo customhouse was occupied about June 15, 1917. Total cost, ₱223,536.82.

Delays in the receipt of materials held the work back somewhat on the Leyte provincial building, but the foundation piles are being driven and the footings started. Ground has been broken for the Ilocos Norte Capitol, and the Pangasinan building is about 60 per cent completed.

Two rather notable reconstruction jobs were carried on during the year, the presidencias at San Fernando, Pampanga, and Bantay, Ilocos Sur. In both cases the old Spanish buildings were wrecked to the walls, which were of the usual massive masonry construction and two stories high. The architectural details of same were executed in cement veneer and concrete floors were put in for both stories. Both buildings have been supplied with tile roofs, and a rather elaborate new porte-cochere gives distinction to the Bantay structure. Costs; San Fernando, ₱32,969.68; Bantay (estimated), ₱7,739.

Barili sanatorium, Cebu.

An addition to the dispensary building, Philippine General Hospital, Manila was built to connect the two buildings of the old dispensary. The lower floor is used for clinics and the upper story by the University of the Philippines for laboratory purposes. The total appropriation was ₱37,000.

The Zamboanga Contagious Diseases Hospital is a very pretty little reinforced concrete structure, and is practically the last word in architecture for this type of hospital. The roof is of cement tiles, the operating room, baths, and toilets are floored with white glazed tiles, and granolithic marble slabs with bronze fittings are used for the toilet partitions. All hardware and plumbing fixtures have been requisitioned from the United States. The project was approximately 75 per cent completed on December 31, 1917.

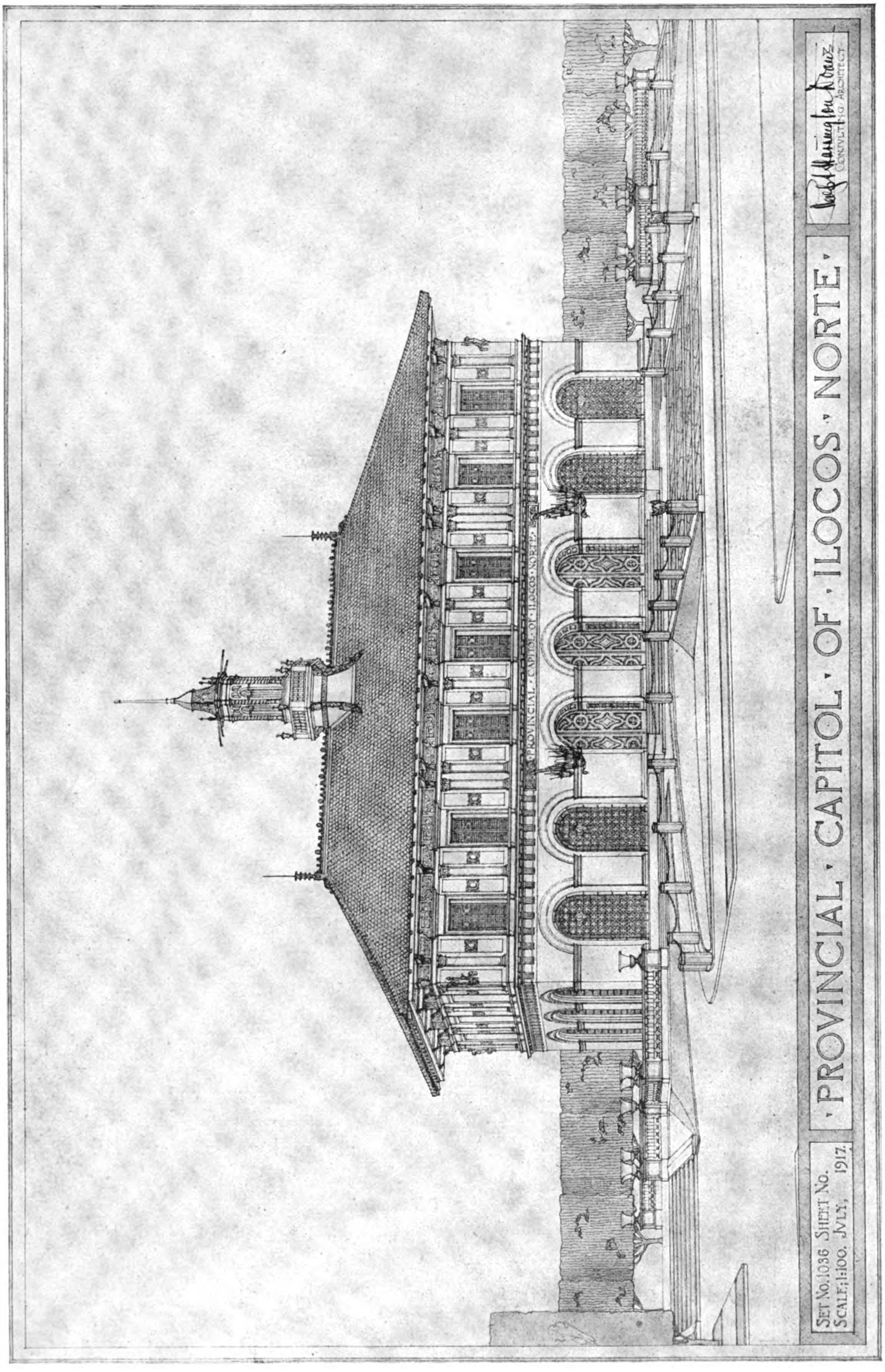
San Fernando municipal building, Pampanga.

Loans for roads, bridges, schools, markets, municipal and provincial buildings, waterworks, etc., from January 1, 1918, to March 31, 1918.

Provinces and projects.	Act Nos.		Total.
	1749	2083	
Nueva Ecija:			
For the purpose of constructing the Malimba, Kilometer Sixteen, Taboating, Baliuag and Talavera Bridges (Manila-North Road)		₱180,000	₱180,000
Provincial building, jail, and storeroom		70,000	70,000
For the purpose of constructing a bridge over the Talavera River		40,000	40,000
Muños-San Jose Road	₱35,000		35,000
Leyte:			
Dagami market	15,000		15,000
Provincial building	70,000		70,000
Pangasinan: New provincial building	100,000		100,000
Rizal: Antipolo kioskos		3,400	3,400
Tarlac: Capas-Concepcion Bridge	30,000		30,000
Tayabas: Macalelon municipal building	2,000		2,000
Total	252,000	293,400	545,400

CONVERSION TABLE.

One peso (₱) = 50 cents, United States currency.
One kilometer (km) = 0.62 miles.
One kilogram (kg) = 2.20 pounds (lbs.).
One centimeter (cm.) = 0.39 inches.
One meter (m.) = 3.28 feet.
One hectare = 2.47 acres.
One cubic meter (cu. m.) = 1.31 cubic yards.
One hectare meter per day = 8.107 acre feet per day.
One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) (second feet)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PROVINCIAL · CAPITOL · OF · ILOCOS · NORTE
SET NO. 1036 SHEET NO.
SCALE, 1:100. JULY, 1917.
CONSULTING ARCHITECT

Provincial Capitol Building of Ilocos Norte (Now under construction).

APPENDIX A.

PROJECTS ACTIVE JANUARY 1, 1917.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plants.	Miscellaneous.	
Abra	2	3																		1							1				2		1	10
Agusan	3	4			1																				1						1		4	14
Albay	2	2		1						1																1								7
Ambos Camarines	2	8			1	1				1			1							6	1			1	1	1								24
Antique	6	2			1					1										1				2		1		1					1	16
Bataan	5	3	1		1																			1							1		1	13
Batangas	7	3		1	3	1				1		1	2						1	2	1		1	2	2	2		4				1	26	61
Benguet	16	11		1	1								1							1		1		1	4	14		2	1			2	13	69
Bohol	5	3	1	1	5															5					1	3		2					3	29
Bukidnon	3	1							1																	1					1			7
Bulacan	1	3			1															1													1	7
Cagayan	5	2			2	1							1							1	2	1				2	1						12	30
Capiz	5	3			8															1						1	1						2	21
Cavite	6	2																		3		2				1							3	17
Cebu	7	2	1										2							3				4		1							3	23
Cotabato	8	3			2															1					1	3	1	1			2		8	30
Davao	9	4			1																				2	2					2		5	25
Ilocos Norte	4	2							1											3		1	2			1							2	16
Ilocos Sur	8	3													1	1				3		1				2	2						12	33
Iloilo	8	6	2										1			1								3	1	2		1			1		8	34
Isabela	4	3																		11						2	1						2	23
La Laguna	5	2	1		2			1												3				1		6		1			1			23
Lanao	4	2			1															3						3								13
La Union	4	5			1															7				1	1		1						4	24
Leyte	3	2			2				1				2							3		1		3	1	1					1		1	21
Mindoro	4	3	1	1	1					1										2	1				1	3		1					3	22
Misamis	5	3			1															1						2		1						13
Mountain Province	18	9			2				1	5			6		1		2			10		1		1	1	11	3	3			2		14	90
Nueva Ecija	8	3																		4		1		1	1	1							1	20
Nueva Vizcaya		4		2																3								1						10
Occidental Negros	14	2		2	5			1					1													2	1						1	29
Oriental Negros	5	4								1			1							1								4			1		5	22
Pampanga	9	7			1			1					1		1					5				1	1	1	1						2	31
Pangasinan	7	2			2			1	1				1							1						2	1						3	21
Rizal	5	5			2															2						3		1					2	20
Samar	5	2			1															2				1			1							12
Sorsogon	7	3				1		1									1			4		1		2		2		2					8	32
Sulu	2				1															6				1	1	6	1	2			1		4	25
Surigao	1	2																		2													1	6
Tarlac	9	3																		2														14
Tayabas	4	3			3															2	1	1		2	3	3							4	26
Zambales	1	3			1																					1								6
Zamboanga	6	6		1	1															3					6	1		1			4		6	35
Total	242	148	7	10	54	4	----	5	5	11	----	1	20	----	3	2	3	----	1	109	6	11	3	28	29	88	16	28	1	----	20	3	166	1,024

NOTE.—Of the 166 projects under the caption "Miscellaneous" are 13 surveys and investigations of roads, bridges, waterworks, etc., 5 wharves, 7 irrigation ditches, 5 river control, 9 hospital buildings, 3 dredging projects, 5 port light stations, 2 docks, 2 port works maintenance, 2 dykes, 2 dams, 1 monument, 1 water tank, 1 irrigation system, 1 customhouse, etc.

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BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS

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Laoag Provincial Building Annex under construction, Ilocos Norte.

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A. T. SYLVESTER, COMPILER

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ARCHITECTURE IN THE PHILIPPINES.

By Ralph Harrington Doane, Consulting Architect to the Philippine Government.

[Director of Public Work's note.—Mr. Doane, retained by the Government for the last two and a half years, left the service on June 30. He was asked to write in a general and comprehensive way on Government architecture and its possibilities. His article follows.]

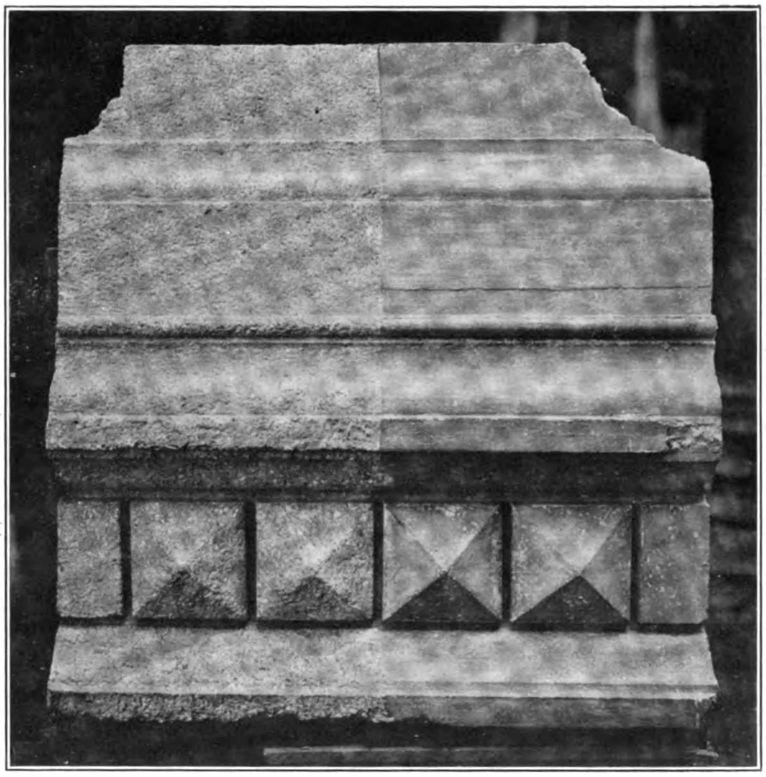
There can be no true democracy without leadership, and there can be no leadership worth while in democracy that is not in the interest of the people as a whole, those who seek spiritual uplift no less than those who desire only material benefits.

Real democracy must provide for the masses what, until the advent of the nineteenth century was reserved principally for the "upper classes," i. e, not only those things which protect the body, but above all those things which elevate the soul; and of these the fine arts have been, since the dawn of human intelligence, the greatest true and living expression.

A government which fails to recognize the right of the people to enjoy the benefits of the great heritage of art; which fails to cultivate and encourage in its people the love of beauty; and which does not recognize, as one of its legitimate functions, the orderly and systematic development of the fine arts is no true democracy.

The Philippine Government, conscious of these inherent duties, has, with respect to the fine art of architecture, established rigid Government supervision. It therefore becomes incumbent upon officials charged with these special responsibilities to carefully analyze past and present architectural accomplishments and procedures and to formulate an architectural policy, which in the future will produce splendid monuments as well as practical buildings, and which will maintain a high architectural standard in public works, commensurate with the dignity of the Philippine Government, and calculated to engage favorable public sentiment and promote a healthy civic pride among the Filipino people.

The fact that there is not, and never has been a characteristically Philippine architecture is not necessarily a reflection upon the genius of the Filipinos. There are many critics who contend, with some degree of justification, that America has no distinct architecture and who accuse American architects of plagiarizing the ancient Greek and Roman and renaissance architectural forms.



Sample showing plain concrete and bush hammer concrete.

The Greeks and Romans borrowed the principle of the column and lintel from the Egyptians, who first utilized it on an extensive architectural scale, and the Gothic architects borrowed the principle of the arch from the Romans, so it is evident that progress in architecture has not been made by the repudiation of early architectural discoveries, but rather by the development and amplification of them. American architects are no more justified in ignoring in the design of modern buildings the rich lore of ancient and renaissance precedents than the Greeks would have been in repudiating the column and lintel of the Egyptians or than the Gothicests would have been in declining to utilize the principles of the arch given them by the Romans.

America began its history, as the Philippines began theirs, without any native architecture, but has legitimately followed ancient and renaissance precedents, making such adaptations as were necessary

Pediment acreteria, Martinez' shop.

to solve American architectural problems. The Philippines might well proceed on the same policy, utilizing the best in the classic, renaissance, and modern architecture, with the modifications necessary to produce a style eminently suitable to these Islands. There is no more logic in refusing to erect buildings in the Philippines of a distinctly American character than there would be in declining to use electricity because of its American derivation.

The Philippine Islands must go through a long period, in which the adaptation of European and American science shall be accomplished, before the field of original research is reached, and so in architecture, they must proceed far with the adaptation of foreign architectures and methods of construction before a distinctly characteristic Philippine style will appear.

Any distinct style of architecture in the future will be based on a legitimate utilization of exotic architectural motives practically modified to conform to the customs of commercial and private life and to the exigencies of tropical heat and torrential rains. Climate conditions seem to prescribe that such an architecture will be of an open type incorporating exaggerated systems of horizontal overhangs.

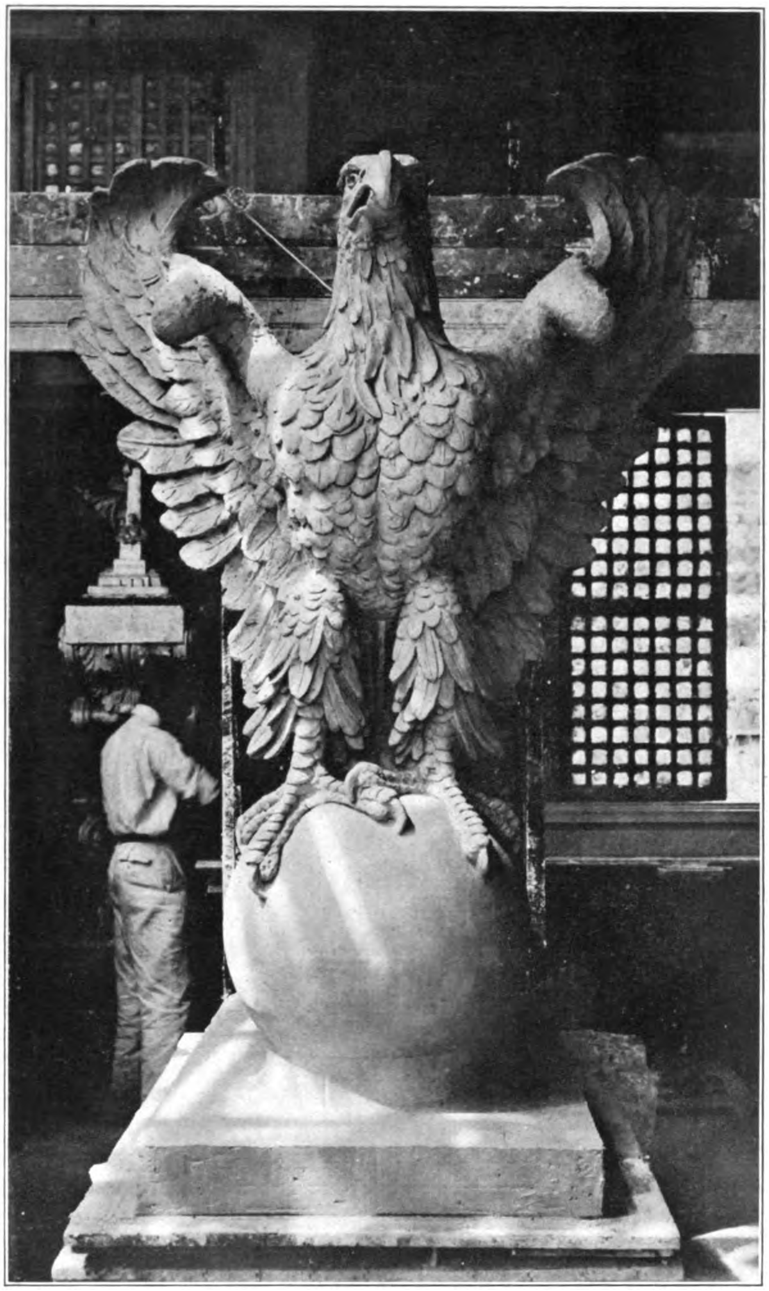
Buildings in the tropics may be made cool by two distinct methods: First, by the construction of tremendously thick masonry walls and minimum fenestration, precluding the heat and resulting in dark interiors often damp and unsanitary. Second, by permitting the constant breezes, which make the tropics habitable, to freely circulate throughout the structure, unhampered by impenetrable construction. This second method produces pleasurable habitations and healthful living conditions.

The only architectural monuments in the Philippines, constructed prior to American occupation, are the churches. They are not however Filipino in character, but on the contrary typical examples of the so called Spanish colonial architecture found in almost every Spanish colony. These churches, constructed of soft adobe stone (a conglomerate material), number in the thousand and constitute an herculean architectural achievement of greater magnitude than has been attempted by the Americans. Most of them are hundreds of years old, and, in addition to their relatively large size, present a charm of antiquity which is most impressive. They were designed by Spanish "padres" who, apparently unequipped with any architectural education made an effort, in the absence of drawings and photographs of Spanish and European renaissance buildings, to reproduce from memory the architectural forms which they were accustomed to see in their native land. This procedure has resulted in huge edifices, in general composition roughly modelled after rococo continental ecclesiastical types, decorated with crude and clumsy details of spontaneous and unprecedented character, merely approximating the form or more refined European work. Built of a soft porous material as they are, these edifices have through the decades absorbed enough moisture and vegetable matter to produce considerable surface vegetation, resulting in charming color and picturesqueness quite alleviating their gross proportions and clumsy details.

Spanish colonial churches are found in all parts of the Philippine Islands. Ecclesiastical projects were, in the days of Spanish Government, constructed in remote districts, of such magnitude as to absorb almost the entire communal wealth. When the Spanish Government was overthrown it is no wonder that reactionaries attempted to destroy many of these edifices, the results of forced labor and oppression. However, to-day personal observation has established the fact that Filipinos now regard these huge architectural monuments with the utmost local pride and appreciation, and it is believed that these impressive ecclesiastical monuments, standing as they so frequently do in the midst of towns built up of nipa huts and modern clap-trap galvanized-iron abortions, have a most potent influence upon the community, and present an impressive example of stability far reaching in its effects upon human life in the vicinity.

At the time of the American occupation, the public works of the Spaniards were totally discredited. Spanish methods of building were without consideration ruthlessly abandoned, and a régime of reinforced concrete and galvanized iron inaugurated, which, for decades to come, will irradicably disfigure what once were picturesque Spanish cities and towns. Adobe stone, clay products, native Philippine woods, and other logical building materials at hand were abandoned and the importation from foreign countries of cement, steel and galvanized iron, and even wood was undertaken on a large scale. While reinforced concrete construction was and still is advisable, on account of earthquakes, for the larger and more important projects, there are vast numbers of small Government buildings erected annually in which mass construction and native materials might be used exclusively.

The Philippine Islands are rich in their natural resources of building materials, which, except for a large cement manufacturing plant at Binangonan, Rizal province, are largely undeveloped. In almost all parts of the Islands beautiful lime stones and marbles can be found comparatively near the surface and in large quantities, but in most cases, due to volcanic action they are broken up in pieces too small for building blocks. However, it is known that in certain locations, deeper in the earth, exist suitable quarry sites from which building blocks might be obtained which would equal or surpass in beauty the handsomest of Europe or America. In fact, marble is so prevalent that a kind almost resembling Botticchino, largely imported from Italy to the United States, is crushed and used for road surfacing in the province of Iloilo. While the rich quarries of this Archipelago are so undeveloped at present as to make it impossible to obtain stone ashler veneers for concrete walls, it is hoped in the


Lingayen eagle.

Group of four articles, synthetic stone, in Nepomuceno's shop.

future that public and private buildings in great numbers may have lime stone and marble exterior.

Clay abounds in almost every municipality, and silica and natural coloring matters are locally available for the manufacture of ceremices, yet this industry has been so neglected that it is necessary to use roofing tiles made of cement imported from Japan, a most uneconomical and illogical procedure.

Stands of superior hardwoods equal and surpassing in beauty the ebony, mahogany, and circassian walnut, so extensively imported in the United States are prevalent, nevertheless the lumber industry is so imfantile and congested that lumber of mediocre character can be obtained only with great difficulty for the interior finish of Government buildings and for the construction of furniture and accessories.

There are bronze workers in Manila, doing remarkably fine work, who, for lack of a proper knowledge of foundry work, are obliged to literally carve their finished products from the roughest and most crude castings. The dissemination of scientific information in regard to bronze foundrying would doubtless give considreable impetus to this splendid craft.

The Spaniards imported marble floor tiles, an impossible procedure just now and an expensive one at any time. While it is impossible to work extensively the marble in the Islands, for lack of facilities, it is possible to manufacture marble mossaics, which should be immediately resorted to as a substitute for the unsightly cement floor tile now so prevalently used.

The Chinese ornamental iron workers in Manila constitute a most interesting industry. Their work is very skillful, but as in the case of bronze work, lacks a certain perfection because of insufficient knowledge of foundrying. With proper scientific assistance, this industry which is already a most prosperous one, might become very formidable, for the quantity of iron grilles and ornamental iron work required in the open type of buildings suitable to the tropics is considerable. The iron work might be expanded to include all sorts of wrought-iron hardware and electric fixtures.

In time past wood carving of a very fine technique was splendidly done in Manila. It is regretted that most of the best artisans in this craft have passed on to their reward without disseminating their cunning. However, this art is undergoing a renaissance, due to the exceptional demand for wood carving in public buildings, for furniture, and for carved wood electric fixtures of rather elaborate character.

The field of plaster and stucco work has never been properly developed in Philippine buildings. Scriffito so profusely used for the decoration of Italian buildings is a most logical and practical type of decoration for the less important architectural projects in these Islands. It may be applied to concrete or brick surfaces or even to metal lath surfaces, and consists of several layers of different colored stuccos, into which is scraped an ornamental pattern or design exposing in an artistic manner the different colored layers used. It is a most economical method of securing a highly decorated architec-

Chenneaux at Nepomuceno's shop.

tural effect and it is hoped that scriffito will be resorted to with great frequency in future constructions of a suitable character.

The Filipino is naturally a most talented craftsman, and under favorable conditions, is capable of developing and maintaining in these islands a perfection of arts and crafts work equal in quality and cunning to that which one has learned to associate with Japan and China, and it is a tragedy that his natural aptitude for artisanship should be obscured in mediocre productions solely for the lack of a proper contact on a large scale with the splendid artisans of other nations.

The Filipino people as a whole are endowed with artistic impulses. Their instinct is to ornament and decorate where ever possible. They are tremendously fond of pageants and festivals and, with a public spirit highly creditable, whole communities will unite in elaborately decorating their houses and their streets for gala occasions.

In general, according to universally accepted standards, typical Filipino artistic attainments are most unsatisfying. They are unsubstantial and in short, amount to little more than tinselled clap trap. The quality of permanency, while a strong element in the great arts of the world, receives little consideration in Filipino art which is absolutely devoid of the element of substantiality.

Corinthian frieze at Nepomuceno's shop.

If the prevalent artistic taste of the Philippines is considered coarse and garrish, it is due not to any fundamental deficiency in the people but rather to the influences by which they have been surrounded. In the northern part of the Archipelago live tribes of almost naked mountaineers, whose sole art is revealed in the decoration of head axes, spears, and the rude implements of uncivilized existence. In the southern islands, less than a thousand miles distance, live a fierce Mohamedan people, who, aside from a few touches of exotic southern Mediterranean art, are artistically as undeveloped as the northern inhabitants just mentioned. Between these extremes, live the great bulk of the Filipino people, who, prior to the American occupation, knew only their own primitive instincts and the influences of Spain, which in the matter of art were of the most tawdry and superficial character.

This rather severe impeachment, it must be said in all fairness, should not be interpreted to apply to those Filipinos who have had special education or other advantages either at home or abroad, for there are many such who possess real artistic appreciation and ability. Promissing young Filipino architects, artists, and sculptures might easily be cited whose attainments will be limited, not so much by their personal capacities as by the influence to which they are subjected in the future.

In the early days, the Americans enforced a bare, severe, undecorated architecture as an antidote for the prevalent garish tastes of the native people. Such a severe architecture, as is only permissible in conjunction with the finest building materials was attempted in concrete, a material which though structurally excellent is artistically bastered, and in no way expresses the native luxuriance of the tropics or the prevalent ease of life in the Far East. This architectural procedure met with local dissatisfaction on every hand. The Filipinos were willing to be shown a new architecture if it could be richly decorated, but were not willing that their public buildings should be devoid of any embellishment whatsoever, little more, in fact than warehouses.

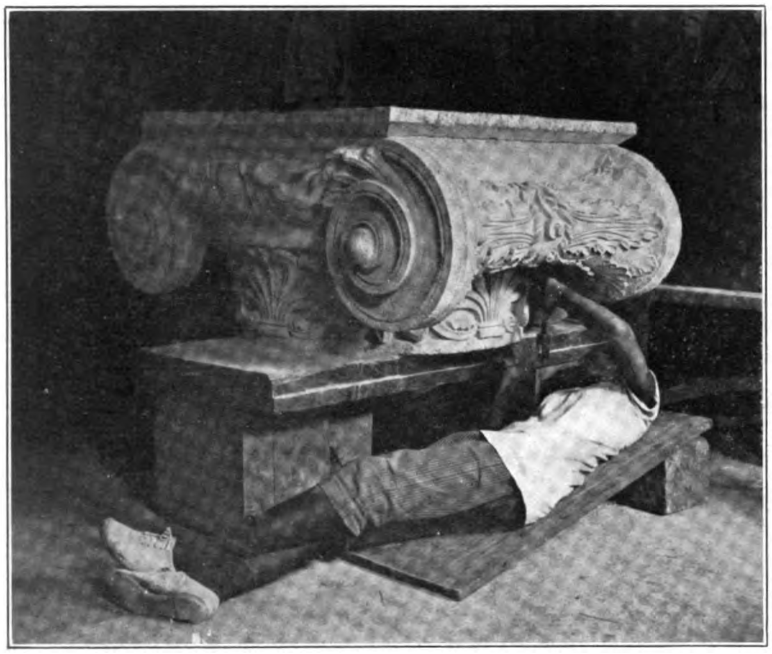
The following considerations have led to the inauguration of a new architectural policy in the Philippine Islands, viz.: Concrete for the exterior of monumental building projects is admitted by the architectural profession to be the least desirable of all masonry materials. Its natural color is gray and lacking in vibrant quality capable of producing pleasurable color sensations. Furthermore, while the natural effect of time upon accepted building stones produces a weathering beneficial to their tone quality, the effect of weathering upon concrete is decidedly detrimental, and results in a more unsightly and depressing aspect than is presented by the newly constructed material.

Since the construction of genuine ashler stone exteriors is impossible at the present time, a synthetic artificial stone has been devised comprising granulated particles of handsome local marbles, previously referred to in this article, mixed with cement in such proportions as to make the marble particles completely preponderant. The surface of this product, being tooled to expose the actual marble aggregate, produces a vibrant color tone by virtue of the exposed particles of marble, and resembles in mass the appearance of white marble or cream warm lime stone, as may be desired, which responds to the gorgeous colorings of tropical sunlight.

It is an acknowledged architectural precept that the softer the material the more it may be decorated. Ornament is produced in terracotta with the utmost facility, hence, it is considered good taste that terra cotta buildings shall be highly decorated. The synthetic stone above described, for plain wall surfaces, is manufactured at various buildings sites, but the ornamental parts are manufactured in Manila (in accordance with the policy of producing all architectural and building specialties in Manila for shipment to the provinces) by a special corps of fifty or sixty sculptures and moulders working under the supervision of the Consulting Architect. Since the manufacture of this synthetic stone is found to be somewhat analogous to the manufacture of terra cotta, it is found possible to obtain without unreasonable expense, an ornamentation of public buildings consistent with the standards of good taste exemplified in classic and renaissance architecture.

Government buildings have already been practically completed under this new policy. They represent a substantial architectural beauty in accordance with best architectural traditions and precedents, as well as a practical solution of tropical climatic conditions. They have inspired the pride and interest of the communities in which they are located and seem to demonstrate that the Filipino people are willing to forego the shoddy gaudiness of Spanish standards for the more substantial and satisfying results of legitimate architecture.

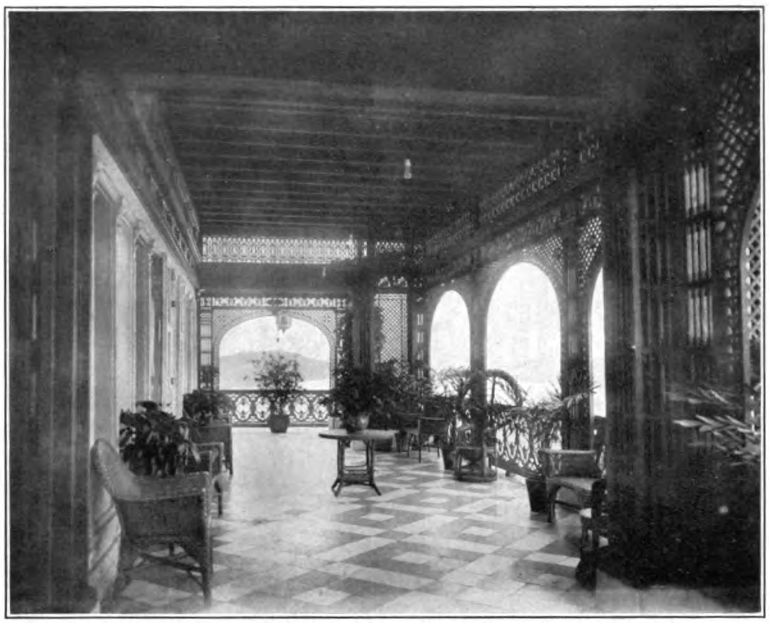
The Philippine Islands are on the threshold of an architectural era of great importance in their history. Never before has there been so prevalent a desire for monumental and imposing public builings. The coffers of the Government Treasury are well filled and prosperity is evident on every hand. Entirely aside from a very considerable amount of standard schoolhouse and market construction, the Government architectural division is engaged on the following bonafide projects either actually under way, or for which appropriations have definitely been made, a conservative cost estimate of which is ten million pesos, or five million dollars, gold, viz.:



Carving a collonade at Nepomuceno's shop.

1. The Insular Government Building	Manila.
2. The Jones Bridge	Manila.
3. Post-office	Manila.
4. Malacañang Executive Building	Manila.
5. Alterations of the Malacañang Palace	Manila.
6. General Hospital Dormitory	Manila.
7. High schools	Manila.
8. Insane and contagious disease wards, San Lazaro	Manila.
9. Trade school	Manila.
10. Pierhead houses and water-front construction	Manila.
11. Provincial Capitol	Pangasinan.
12. Provincial Capitol	Leyte.
13. Provincial Capitol	Ilocos Norte.
14. Contagious disease hospital	Zamboanga, Mindanao.
15. Normal School	Zamboanga, Mindanao.
16. Presidencia	Burauen, Leyte.

Such a tremendous volume of architectural work demands and deserves a very efficient and high-class architectural organization. The Consulting Architect's Office at the present time has fifty-three employees, all of whom are engaged in office work, inasmuch as district engineers in the various provinces perform the necessary structural inspections in connection with building projects.

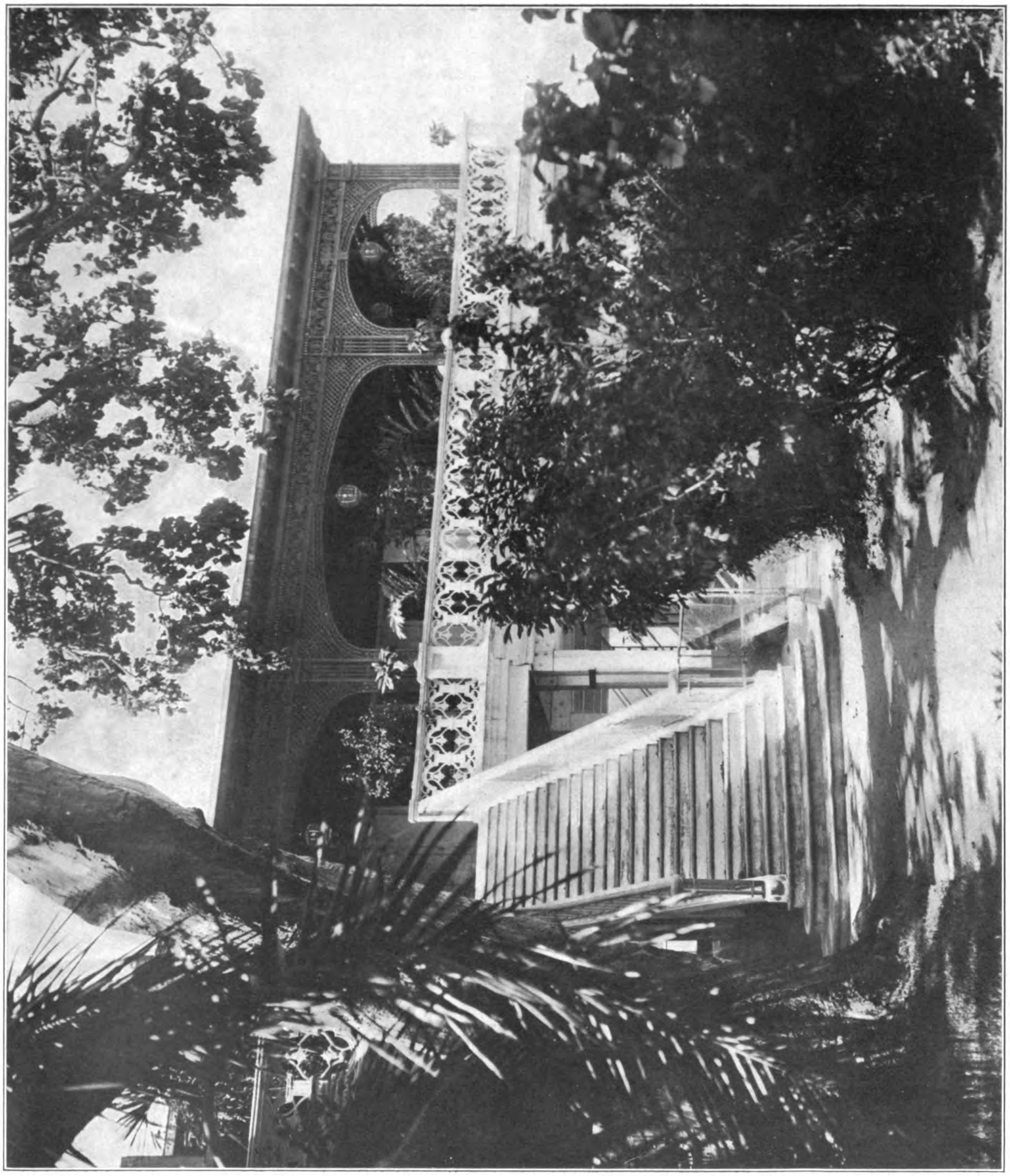


Photograph, Malacañang clearstory.

Filipinos are naturally most expert draftsmen. The ability to draw is remarkably prevalent among the Filipino people and the standard of draftsmanship in the Government architect's office is not surpassed by that of architectural organization elsewhere. It is regretted that there are not a sufficient number of educated Filipino architectural designers available to produce the architectural designs required for public works. Only five Filipino architects have been educated in America and at the present time there are no Filipino students abroad pursuing architectural studies. Unless immediate steps are taken to interest young men in this profession, and unless immediate steps are taken by the Government to educate abroad talented young men in the fine art of architecture, it will be impossible to cope with the constantly expanding architectural program of the Government. There are so many urgently needed specific building projects that it is impossible to give such attention as is advisable and necessary to city planning problems throughout the Archipelago, and furthermore it is impossible with the limited supply of trained architects available to properly study in advance the larger architectural composition of which the first units are now being erected.

The Consulting Architect is by law required to approve all Government buildings, insular, provincial, and municipal, whether large or small, throughout the Archipelago. This brings to his office a tremendous volume of work covering a wide range of important and nonimportant projects. It would be a fine thing if the Consulting

Wood carving at Tampinco's shop.



Photograph of corner carving—Malacañang clearstory taken in sunshine.

Architect's Office could be augmented by an auxiliary force, organized especially to do small town work and to supply picturesque and attractive designs for use in minor communities, giving such work only the amount of architectural study and detailing appropriate to its relative importance in scale of Government architectural work. At the present time numerous small town projects are necessarily abandoned to the mercy of local "maestros de obras," or local contractors, for want of sufficient designers in the architectural division to properly attend them.

The standardization of public buildings is, under present economic conditions, necessarily the only policy. For every schoolhouse that can be designed there is the demand for the simultaneous construction of let us say ten others; and for every municipal building that can be designed there is the immediate need for, let us say, five simultaneous similar constructions. Standardization is obviously the only practical procedure under these conditions. As the architectural division grows and becomes able to cope with the demands for public works, it is hoped that the tendency toward standardization will be abandoned. Just as a person has individuality and individual taste in the matter of clothes and personal adornments, just so communities have a collective individuality and desire individuality in their public works. Instances can be recalled where a municipality, for example, has lost entire interest in a town hall project simply because it was ascertained that it was to be, when completed, identical to one in an adjacent town. Public spirit can be marshalled to improve public works in a manner to give the community distinctness, but becomes apathetic when required to construct architectural replicas. Standardization of Government buildings in the United States has during the last two years been seriously considered by Congress, but has met with the unqualified opposition of the architectural profession. In many cases, standardization in buildings is impracticable because of variations in sites, market conditions, and the customs and habits of various communities. While standardization of architecture may be necessary during formative periods such as now exists in the Philippine Islands, as a policy to be perpetuated, it is never desirable.

Prevalent wide spread and general interest in architecture is most gratifying. The importer is specially interested in Government functions with respect to customs; the medical profession is specially interested in Government control of Public Health; and the agriculturist is specially interested in agricultural legislation, but the importer, the physician, and the farmer, as well as the butcher, the baker, and the candlestick maker are all intensely interested in the Government architecture of their respective communities. Architecture is a major fine art wide in its appeal. It has been through all the ages the universally popular enterprise of mankind, in which people have expressed the degree of their civilization. We know more about ancient races directly and indirectly from their architectural monuments and accessories than through any other source of information. So, let us hope that while the utilitarian aspects of Philippine architecture will not be neglected, its historical significance and artistic importance may be emphasized, and that the rich resources of this land may be marshalled in the production of an architecture sufficient in quantity and quality to announce to posperity the constructive genius and artistic accomplishments of the present day.

IRRIGATION POSSIBILITIES AND DEVELOPMENTS.

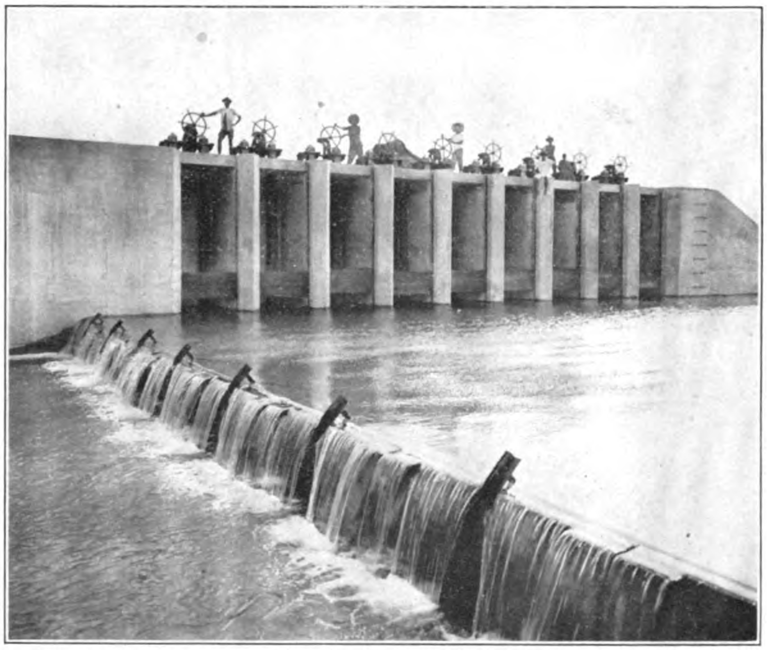
By R. H. Shoemaker, Assoc. M. Am. Soc. C. E.

The material well-being of a community may be said to depend on the extent to which the natural resources are developed for the benefit of the greatest number of the members, and in a country like the Philippines, whose wealth comes so largely from agriculture, there is no phase of public work which has such a direct bearing on the prosperity of the people as that of irrigation.

Irrigation has been practiced in the Philippine Islands probably from the earliest times, and in some localities has been brought to a high state of development by private and communal enterprise, but it is only recently that the necessity and propriety of Government aid and supervision has been recognized. Many causes have contributed to this awakening; the breaking up of the large estates; the desire for more permanent and efficient systems; the examples of successful development in neighboring countries; perhaps most of all the increasing prosperity of the landowners which makes it possible for them to contribute their share, without which Government aid would be ill-advised paternalism. The present necessity, from an economic as well as a patriotic standpoint, of reducing the imports of food supplies to the lowest possible point is an additional argument, and a very powerful one, in favor of any measures which will increase local food production.

The following outline of the policy which is being formulated and of the workings of the Irrigation Act is given in the hope of promoting a better understanding of the benefits to be obtained by close coöperaiton between the Government and the individual.

Irrigation systems may be divided into two general classes: Those serving populous communities where the land is privately owned and is already under cultivation, and those designed to bring under cultivation large areas of unproductive land. With the second class we have little concern at present. There are large tracts of public land in many of the provinces which offer excellent opportunities for future development but it will generally be found that they have remained unoccupied for one or more of the following reasons: Lack of transportation facilities; unfavorable health conditions; difficulty in obtaining water for irrigation; and too often, lack of local enterprise. Such development will require years of preparation and larger expenditures than would be possible at present, and in most cases carefully worked out colonization schemes will be necessary to insure the success of the projects.



Head Gates of San Miguel Irrigation Dam, Tarlac Province.

The demand which we now have to meet is for systems which can be constructed at a reasonable cost, and which will bring the occupied land to the highest state of cultivation with as little delay as possible. In some cases irrigation is needed to increase the production, in others, to insure against unusually dry years. Frequently, the need is for permanent works to replace an old system which is unsatisfactory and expensive to operate.

There are three ways in which Government funds may become available for irrigation work.

(1) Municipalities are now authorized by law to construct and operate irrigation systems and may receive as aid from the Insular Government two-thirds of the cost of systems so constructed. The Secretary of Commerce and Communications may allot for this purpose not more than ₱100,000 in any one year. Systems constructed under this provision become the property of the municipality and an annual tax of ₱2 per hectare irrigated is paid by the land-

owner to the municipality for the operation and maintenance of the system.

(2) Insular irrigation projects may be constructed by the Government and paid for by the landowners in annual installments extending over a period of from 20 to 40 years. The annual charge paid by each landowner is based on the area of irrigable land held by him and is made up of the following items:

(*a*) A proportionate share of an amount which at the end of the period fixed will reimburse the Government for the cost of the project, with interest at 4 per cent per annum.

(*b*) An amount to cover the cost of operating and maintaining the system.

(*c*) An additional amount to be fixed by the Secretary of Commerce and Communications which is placed to the credit of the irrigation insurance fund for the purpose of rebuilding or repairing projects which have been damaged or destroyed by earthquakes, floods, or other natural causes.

Systems constructed under these provisions are administered by the Government under the supervision of the Director of Public Works until the final payments have been made. At the end of this period the system becomes the property of the landowners, organized as an irrigation community, and is administered by them.

(3) Under section 28 of Act 2152 private individuals may apply for Government aid for irrigation, subject to regulations and conditions imposed by the Secretary of Commerce and Communications. Under section 10 of Act 2652 Government funds may be loaned to corporations or associations owning lands which they desire to form into an irrigation district. Such loans are limited to one-half the estimated cost of the system and cannot exceed ₱50,000 on any one project. A period of twenty years is allowed for repayment. The latter section was probably intended as an amplification and correction of the former, though section 28 still stands unrepealed.

The Irrigation Act, which contains the above provisions, is a model of progressive legislation along these lines, but in order that its advantages may be realized in full, a clear understanding of the obligations which it imposes is required.

The most frequent misunderstanding is in regard to the cost of modern irrigation work and the amount which may be invested with assurance of a fair return. In times past, it has been the custom to construct small systems, more or less temporary in nature, by the use of voluntary labor and with little or no expenditure for materials; and there is a tendency to compare the cost of such work with that of properly designed, permanent systems to the disadvantage of the latter, overlooking the fact that the old systems required reconstruction every season and in many cases became worthless after a few year's use.

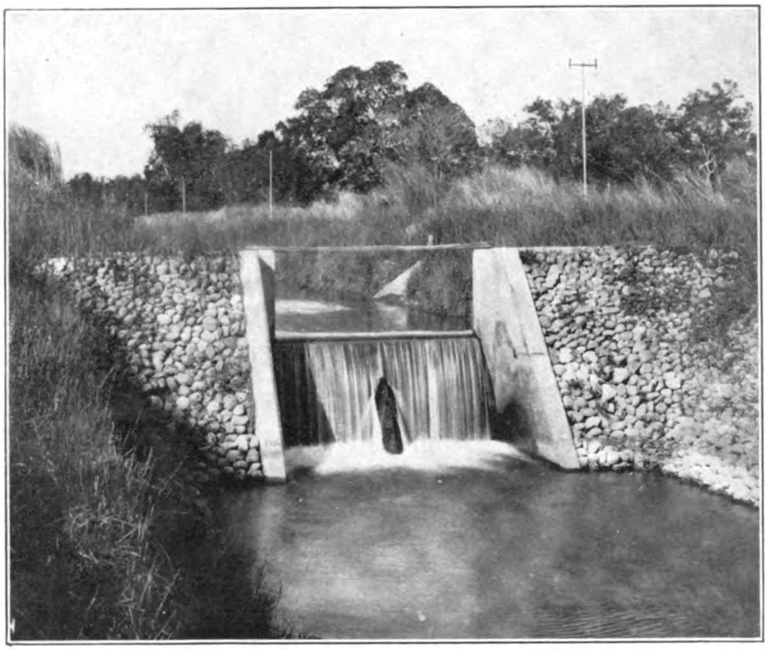
It is impossible to give a general estimate of the cost of irrigation in the Philippine Islands, as each project presents its own difficulties, and conditions vary widely in different localities. Estimates have been made for a number of projects, varying from ₱50 to ₱200 per hectare irrigated, which compare favorably with figures obtained from other countries. In Java the average cost of some of the most important systems is ₱130 per hectare. In the United States costs have ranged from ₱100 to ₱900 per hectare, with a probable average of ₱300. In parts of Italy where rice is a staple product and sells at prices comparable with those obtaining in the Philippines, an annual charge of ₱40 per hectare is paid by owners of rice lands. On the basis of repayment in 40 years this would correspond to a first cost of about ₱500 per hectare.

Where, as is often the case, the crop yields can be doubled by irrigation, property owners should not hesitate at an investment of ₱200 per hectare, involving an annual charge of ₱15 to ₱25 per hectare, though ordinarily a much lower figure may be expected.

It must not be thought, however, that all difficulties have been overcome when funds have been secured and the system built. The success of an irrigation system depends fully as much on efficient operation and use as on proper design and construction. The whole problem of successful irrigation can be stated in four words—economical use of water. This is particularly the case in the Philippines where the main characteristic of the streams is their small flow during the dry season, as compared with the rainy season discharge. The growing of rice requires more water than any other crop and in most of the projects which have been investigated, the water available is not sufficient for the second rice crop, which is generally desired by the farmers in spite of its doubtful effect on the productivity of the land. Under such circumstances, if the system is to be used to the best advantage, other crops requiring less water must be alternated with the rice crops.

A great portion of the water delivered to the land may be and often is wasted under the old haphazard methods. Under systematic management, arrangements are made whereby each consumer receives in rotation such quantities of water as can be used to advantage. These matters can be regulated and enforced by strict Government supervision but the best results can only be secured by coöperation between the water users themselves. An ideal irrigation community is in effect a republic in miniature so far as the use of water is concerned; electing its officers, appointing water masters and other employees, formulating rules, and all sharing in the benefits of the system.

One fact which is often overlooked and which tends to prejudice landowners against irrigation is that a system is less efficient and more expensive to operate during the first years of its use. The losses of water from leakage in the canals, which are always serious in a large system are much greater when the water is first turned in, sometimes amounting to the entire supply. Land newly brought under irrigation also requires much more water to produce the same results than where irrigation has been practiced for a number of years. Besides these factors, there are often minor defects to be remedied in a new system which increase the cost of operation and may temporarily affect its efficiency. If these matters are not taken into acount, the first results may be very disappointing and discouraging.


Fall in main canal of San Miguel Irrigation Dam, Tarlac Province.

Readers of this article will be sufficiently familiar with the ordinary features of irrigation systems so that no explanation is needed but reference may be made to two methods which have so far not proved applicable to the Philippines.

In designing irrigation systems for the arid regions in the United States and in other countries, provision has generally been made for the storage of a portion of the rainy season flow for use during the rainless months. Even in countries which, unlike the Philippines, are provided with lakes and other suitable storage basins, this involves enormous expenditures. An idea of the amount of water needed for irrigation may be gained from the following figures:

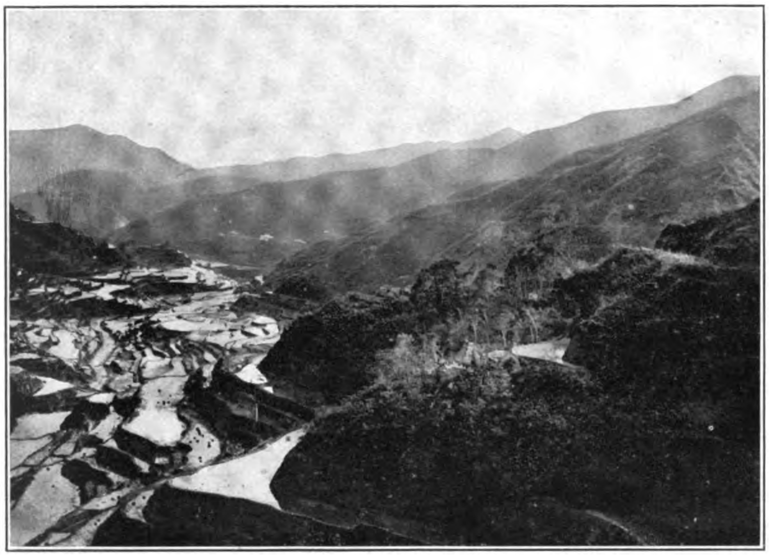
The water used during the ordinary rice-growing season if applied at one time would cover the ground to a depth of about 1½ meters.

If it were desired to store one-half the amount required for irrigating 1,000 hectares in a reservoir of 100 hectares area, the average depth would be 7½ meters; if the storage area were only 10 hectares, a depth of 75 meters would be necessary. It can easily be seen that this would be feasible only under the most favorable conditions, and it is doubtful whether any such projects will ever be justified here. A number of high dams were built in Cavite during the Spanish régime, but in most cases storage was a secondary consideration, no provision having been made for using the impounded water.

Irrigation by pumping is another method which requires the most favorable conditions and efficient operation to be successful. Experience in other countries indicates that pumping is profitable only for crops more valuable than those usually grown in the Philippines. Where cheap electric power is available, it may be possible to supplement gravity systems by pumping, even for rice production, but landowners must be prepared to pay much higher annual charges than have ever before been considered.

The following brief outline of the work of the irrigation division of the Bureau of Public Works may be of interest.

The work of preliminary investigations and surveys, including the hydrographic work, is at present the most important. Surveys of several of the more important irrigation projects are being carried on by parties sent out from the Central Office, but the greater part of the investigation and survey work is in the hands of the district engineers. Fortunately extensive investigations were made during the period when the division was well equipped with personnel, and preliminary reports on more than 200 projects are available for reference. The hydrographic work, which consists of systematic measurements of the flow of streams, was suspended for several years, whereby much of the value of previous work was lost, but it is now being resumed, and will be gradually extended to cover all streams of importance. The results of this work are of first importance in connection with projects for the use of water, not only for irrigation, but for water supply and water-power purposes. In the United States this work is carried on in connection with the Geological Survey and the records are published annually, those from the Hawaiian Islands, where water conditions are much the same as in the Philippine Islands, being exceptionally complete. It is the intention to follow this example in order that the information now being obtained in the Philipines may be accessible in a permanent form.



Rice paddies at Ifugao, Mountain Province.

The irrigation division is responsible for the general design not only of irrigation works but of municipal water supply projects of which more than fifty are under consideration. The growing interest of municipalities in securing ample supplies of pure water and their willingness to devote their funds to this purpose is one of the most hopeful signs of the times. In the neighborhood of ₱450,000 is being allotted during the present year from Insular funds as two-thirds of the cost of water-supply projects, the remaining third being borne by the municipalities.

The construction of irrigation and water-supply systems will be largely handled by the district organizations, with assistance and supervision by the Central Office in the case of large and important projects.

The adjudication of water rights, which is the application of the Irrigation Act in regard to adjustment of old claims and granting of new rights, comes naturally within the scope of this division and is by no means the least important of its activities.

The subject is an extensive one and can hardly be touched on here, but it is interesting to know that codes of irrigation laws existed more than 4,000 years ago, and that our present law of waters can be traced directly back to them through the Spanish and Roman laws. For example, the right to the use of water is based on two principles, that of beneficial use and that of priority of appropriation. The Pandects of Justinian, which constitute a digest of the Roman law of waters, state that "It is not acreage, but the use to which the water is put, that measures the right to the water," and the various uses were classified much at present, with domestic use and irrigation among the first.

It is also instructive to observe that among the non-Christians of the Mountain Province, the subject is so well understood that outside assistance is seldom necessary in settling disputes over water rights, in spite of the fact that a single small stream will often water hundreds of paddies belonging to nearly as many owners.

The exact and equitable determination of the rights of individuals to the use of public water is a necessary preliminary and accompaniment to the successful development of irrigation projects, and advancement will be measured to a large extent by our progress along these lines.

Some twenty-five rivers are now in process of adjudication, others have been designated for this purpose and numerous applications for water rights for irrigation, power, and manufacturing purposes have been granted or are under consideration. The final action on these applications, as on all matters concerning irrigation and water rights is taken by the Irrigation Council, which also shapes the policy of the Government in regard to irrigation.

As in all countries where public irrigation work is newly inaugurated, there are many questions which only time and experience can answer, but now that the people are awake to their needs in this respect it is safe to say that all future steps will be in the direction of progress.

From a professional standpoint, there is no career which offers more interesting work, better chances for advancement or a higher reward in the sense of having been of service, than that of the irrigation engineer, and I am confident that no appeal is necessary to enlist the services and enthusiasm of the young engineers who are now completing their training, and on whom will rest the responsibility for the future development of the country.

THE NEW CEMENT-GUN AND SAND-BLAST OUTFIT.

By L. H. Thompson, Mechanical and Electrical Engineer.

One of the most interesting additions to the Insular equipment, is the cement-gun and sand-blast machine recently set up and tried out.

The outfit comprises a 30-horsepower 4-cylinder gasoline motor, belt connected to an Ingersoll-Rand air compressor, all mounted on a substantial steel truck; a J. M. Betton sand-blast machine; and a type N-1 cement gun, together with accessories, totalling nearly five tons.

The air compressor and gasoline engine are of the usual standard design, requiring no comment.

The sand blast is of the usual type, consisting of moisture separator; steel tank with capacity for several sacks of blasting sand; valves, ejector jet nozzles for blowing the sand with compressed air through the hose lines to the steel blast nozzles, etc.

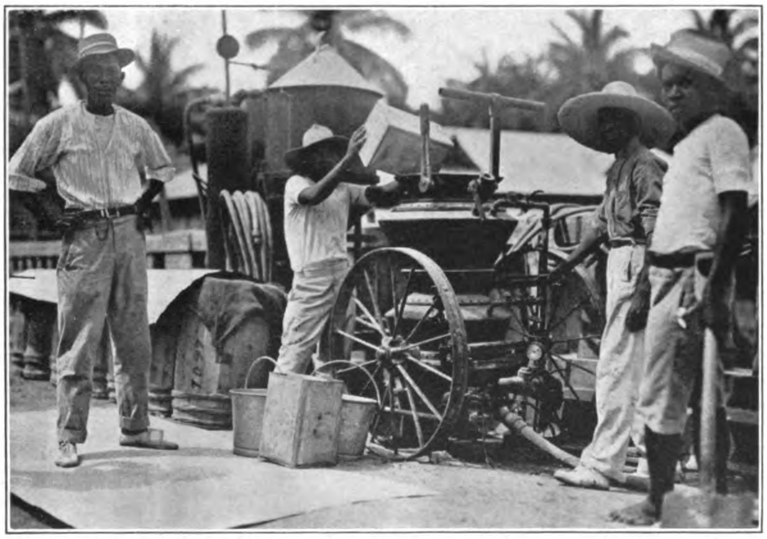
The cement gun, as its name implies, shoots a stream of mixed cement, sand, and water through a hose and nozzle. The machine

Cement gun operating crew at Gumaca, Tayabas.

consists essentially of two conical hoppers—an upper or loading and a lower or discharge, and a feed wheel operated by a small air motor, together with air connections, valves and discharge nozzle.

The upper hopper is opened at the top, for loading, by a large, lever-operated, conical valve, seating on a rubber gasket. Between the two hoppers is a similar valve, on opening which, the cementitious materials drop into the lower hopper, onto the feed wheel. This feed wheel, revolving in a horizontal plane in the base of the lower hopper, consists of a series of pockets or paddles on the periphery of a disc. These pockets pass in turn under a stream of compressed air, by which their contents are blown through the outlet valve into the hose. By manipulating the two hoppers, the machine is kept in continuous operation. Obviously, the materials fed through the machine and hose must be dry cement, sand, and air only, the water being supplied by a separate hose at the operating nozzle. Where water under pressure is available, the water hose may be connected directly to that source. Otherwise, a steel tank has been provided, with connections to the compressed air supply. This tank holds water enough to operate several hours before refilling.

The operating nozzle has an annular water ring to which the water supply hose is connected through a valve to control the flow. From the annular ring, the water is sprayed into the materials passing through the rubber-lined nozzle, effectively hydrating the concrete as it is shot into place. In operation, the concrete shoots from the nozzle in a spray covering perhaps one square foot at a distance of 4 or 5 feet.



Loading the cement gun with dry sand and cement at Gumaca, Tayabas.

The system followed in the first cement-gun job in the Islands may be of interest here. The work requiring repair was a reinforced concrete pile deck girder bridge at Gumaca, Tayabas. The reinforcing steel had corroded badly, breaking off the concrete, and in some cases splitting the girders. Scales of rust up to 3/8-inch thick could be picked off with the fingers. To prevent suspension of light traffic over the bridge, only alternate girders were repaired at a time.

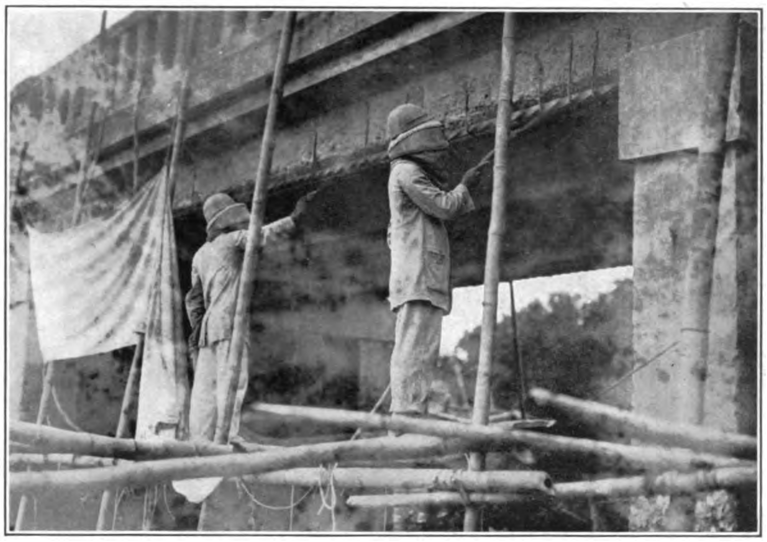
The process of repair was briefly as follows:

(*a*) The steel was completely uncovered by chiseling away the old concrete.

(*b*) Rust was removed by small hammers and sand blast.

(*c*) Concrete was replaced by cement-gun process, without forms or troweling.

A gang of men with hammers and chisels broke off the old concrete from a bamboo staging. Other men followed with small, pointed hammers especially forged for the purpose, knocking off a great portion of the rust. Then two hose lines from the sand blast were directed against the steel, cleaning it thoroughly. For sand blast purposes, a sharp, quartz sand, screened through 1/8-inch mesh is required. Tarlac River sand was used in Gumaca with fair results, but the freight cost makes its conservation imperative. Tarpaulin curtains and carpets were found necessary to catch and reclaim the flying sand for use again. Finally, the cement-gun nozzle was brought into play, re-covering the steel and building up the girder approximately to its original size and shape.



Sand-blasting the rust from the steel, Gumaca Bridge, Tayabas.

The training of nozzlemen proved to be something of a task. A wonderful waste of cement, and the production of some peculiar artistic effects of a "Futurist" nature, were necessary before a degree of proficiency was attained. The entire operating crew comprises:

One foreman and mechanic.
One engineer for compressor outfit.
One operator for valves, hoppers, etc.
Two nozzle men.
One man drying sand, etc.
Two mixers.
Six or more men chiseling old concrete, etc.

It is proposed to keep five of this crew permanently with the outfit, other laborers to be secured locally, wherever the machine is to be used.

Considerable experimenting was necessary in first trying out the machine in the Islands, to determine the proper amount and pressure of air, speed of feeding mechanism, ratio of cement and sand, method of operating the nozzle, thickness of concrete to be placed at one time, etc.

Concerning these experiments, the following conclusions may be of interest: It was found that the sand must be perfectly dry, and better screened to less than 1/8-inch. This necessitated keeping one man busy spreading sand on tarpaulins along the road to dry. For wet weather, some sort of hot salamander to dry the sand would be necessary. A mixture of 1 cement to 3 Tarlac sand was first tried. It was found that approximately half the sand rebounded from the surface. The cement-gun booklet states that the amount of "rebound" will vary with the kind of sand, character of the work, etc. The conditions at Gumaca were of course favorable to a large loss, due to the irregular shapes and small areas of the girders, as well as the inexperience of the crew. This "rebound," however, contains only a small amount of cement. It therefore appeared that the concrete actually in place was exceptionally rich in cement. Thereafter, various mixtures were tried, and in every case within practical limits, the proportion of rebound remained approximately 50 per cent of the sand used. The rebound sand was caught on canvas tarpaulins, dried, and used again. Very satisfactory results were obtained by mixing new sand 1 to 4 and rebound sand 1 to 5, making the concrete actually in place, perhaps 1 to 2 or 1 to 2½ in consistency. Experiments proved that concrete approximately ½-inch thick could be built up at one time. After half an hour, another ½-inch could be added, etc. Applications thicker than ½-inch at a time, had a tendency to fall off the lower side of the girder, before it could set sufficiently to hold its own weight. It was also found more effective to hold the nozzle 4 to 6 feet from the girder. At closer range, there was a tendency to displace the concrete already applied. Again, it was found that a rapid sweeping motion of the nozzle from end to end of the girder, was more effective and satisfactory than an effort to build up any one spot to the desired thickness at once.

The cement gun nozzle in operation, Gumaca Bridge, Tayabas.

As for quality of results—in appearance, the repaired girders are fairly smooth and even on the sides, with only rolling irregularities, not particularly noticeable or unsightly. On the bottom, there is a tendency (rapidly growing less as the operator improves in skill) to form small drip points or stalactites of concrete perhaps ½ inch long. The suggestion that these be smoothed off with a trowel, however, allows of an argument as to whether the slight gain in regularity of appearance would offset the destruction of the naturally dense, nonporous and adhesive mass, and the loss of the nonabsorbing surface skin by troweling.

As regards the strength and durability of the repair, time only can tell. The appearance of the concrete after a few weeks set, seems to bear out the "gunite" claims for superiority of strength, density, adhesion, etc. Even the small stalactites hanging from the bottom of the first girder were difficult to break off.

The cement-gun process of application is claimed by the manufacturers to produce a very superior quality of concrete, for several reasons:

Some of the cracked and defective girders, and the steel work uncovered ready for the cement gun, Gumaca Bridge, Tayabas.

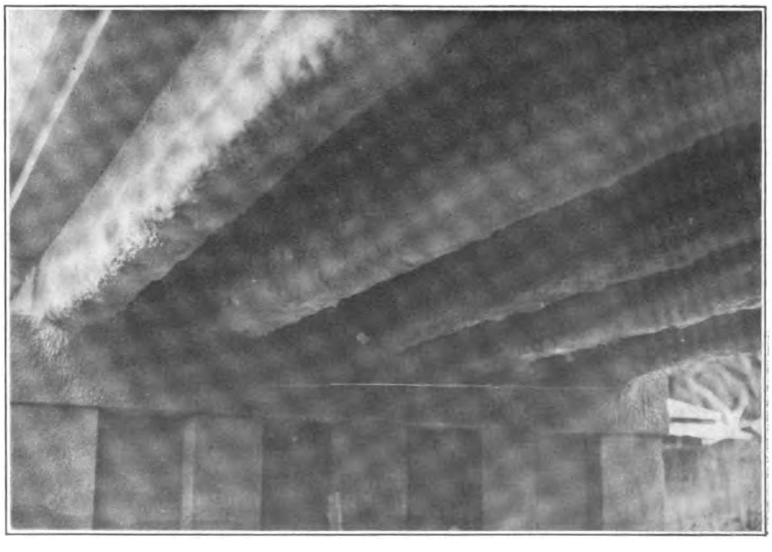
(*a*) Due to hydration at the instant of application, all the advantage of the initial set is retained. There is no subsequent working over or mixing such as necessarily occurs in other hand or machine mixed mortars.

(*b*) The method of application by forcible projection produces an exceptionally dense, nonporous mass.

(*c*) Due to a natural outcome of the process, the bonding to steel, or old concrete is much more effective than by any other process. This is occasioned by the tendency of the sand particles to rebound from hard surfaces. The cement adheres, forming a layer of practically neat cement, tamped and forced by the rapidly hammering sand particles, into intimate contact with the bonding surface. Tests of "Gunite," as the product of the cement-gun is technically called, have proven the soundness of the above claims in the States. In tension, compression, permeability, adhesion, etc., as compared with other mortars of similar proportions, Gunite, in every case, proved markedly superior.

Regarding speed of work, cost, etc., no trustworthy figures are available, owing to the fact that much of the first job was experimental in nature. However, some figures obtained after one month of operation may prove instructive: The entire cost of repairing the six span bridge at Gumaca will total approximately ₱2,500, including the experimental expenses—

Cement used—approximately 2 barrels per girder.
Sand—about ½ cubic meter per girder.
Gasoline—less than 1 case per girder.



The repaired girders of the Gumaca Bridge by cement gun process, Tayabas.

Removing old concrete—approximately ₱10 per girder. (This is the slowest part of the operation.) Three to five girders can be covered by the sand-blast and cement-gun per day. With the ever-present shortage of labor, however, it was found practically impossible to operate the gun more than one-third the time, owing to the labor necessary to chisel off the old concrete, dry and prepare the sand, build and move scaffolding, etc.

The cement-gun process undoubtedly makes a much stronger and more durable repair than any method yet devised for replacing the concrete by trowel or pouring forms. It is doubtful, also, if hand application could compete with the cement-gun in point of expense.

The outfit has proven an unqualified success on this class of work, and will undoubtedly save a number of salt-corroded structures now in the Islands.

TO USE A CAMERA AS A PANTOGRAPH.

By W. C. West.

The following method has proved both successful and expeditious in plotting a road survey upon an existing map, when the scales are different.

Neither film nor plate is used. The ground glass is removed from the camera and laid over the map upon which it is desired to plot the road survey. Two or more points through which the road passes are marked in pencil on the glass, which is then replaced in the camera, and the latter focussed upon the field map of the line in question so that the points chosen (municipalities, barrios, etc.), as plotted on the field map, coincide with the corresponding points as marked on the glass. The entire line is then traced in pencil on the ground glass, from this transferred to tracing cloth, and then by means of carbon paper and a stylus is marked upon the map desired. Care must be had that the planes of the field map and ground glass are parallel while the picture is being "taken."

The method is especially valuable in determining whether a new road location through rolling country is sufficiently direct between main controlling points to warrant its acceptance, as Mr. N. R. Baugh, District Engineer of Laguna, found in the case of the Cavinti–Luisiana Road.

A SCALE FOR READING DISTANCES.

By R. H. Shoemaker.

A scale for reading distances in feet from plans drawn to metric scale is found convenient in figuring floor loads and estimating lumber, reinforcing steel, and similar material.

The example shown is to a scale of 1:50 metric and is very easily constructed as follows:

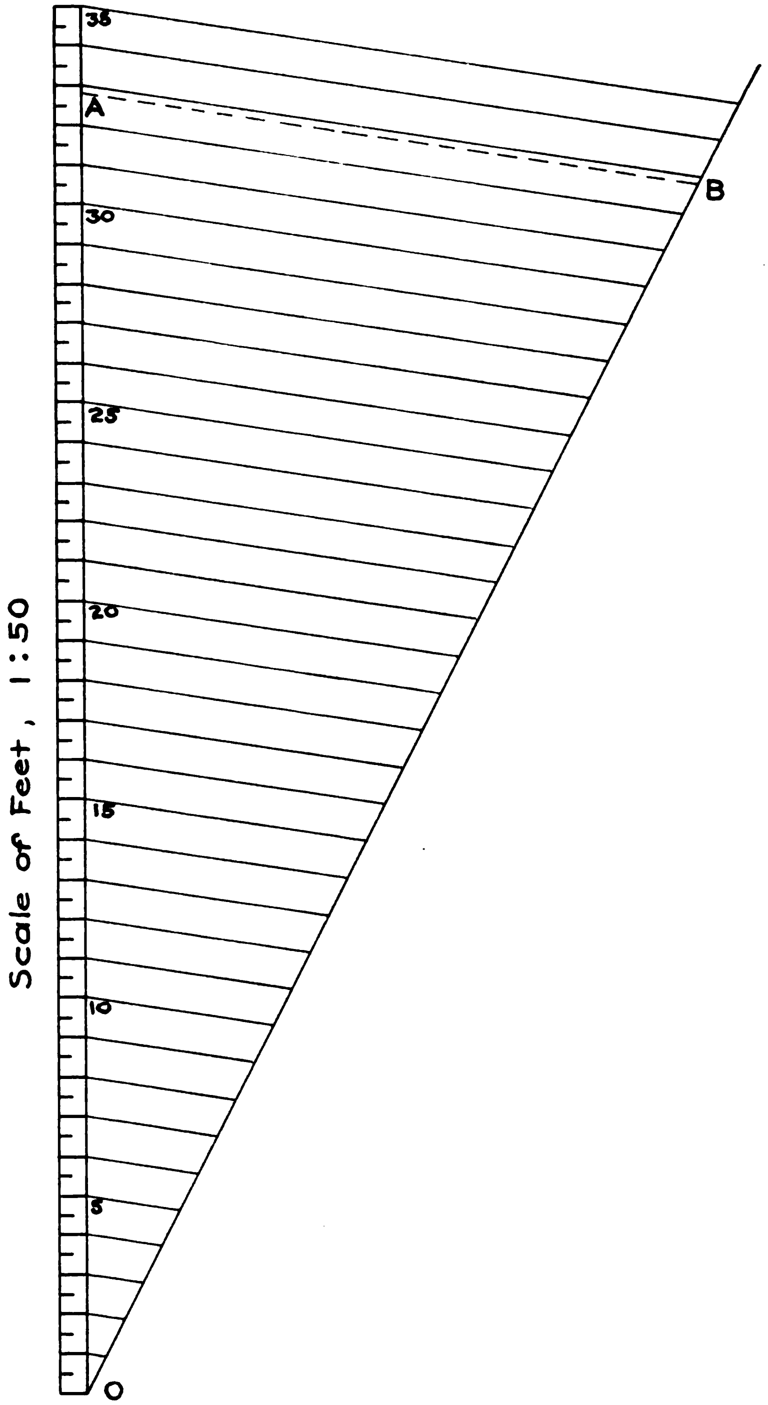
On one of two intersecting lines lay off the distance OA equivalent to 10 meters on the proper scale. On the second line, OB, lay off 32.8 feet to any convenient scale (in this case, ¼ inch equals 1 foot was used).

Through the division points on OB draw parallels to a line connecting the points A and B, representing equivalent distances on the two scales. The intersections of the parallels with OA will form the scale.

Scales can be constructed of course for any metric scale desired and for many other combinations; as for obtaining distances in feet or meters maps drawn to a scale of miles or vice versa, and for use on reduced or enlarged maps and plans.

The same method can be used to construct double or triple scales of metric and other equivalents which are often more convenient to use than conversion tables or factors.

The writer is indebted to Slichters "Elementary Mathematical Analysis" for this and other interesting graphic methods.



ON THE JOB HERE AND THERE.

Mr. E. J. Westerhouse, formerly Director of Public Works, is now general manager of the Manila Railroad Company, Manila.

Mr. Morgan Cilley, formerly an engineer of this Bureau and later with the office of the supervising architect, Treasury Department, will soon severe his connection with that office to accept a position on the editorial staff of the Engneering News Record in New York City.

First Lieutenant Frank D. Nash, formerly a division engineer of this Bureau, went with the first engineering expedition to France.

Mr. J. H. Carnine, formerly an engineer of this Bureau, has enlisted in the military service.

C. A. Buensuceso, of Barotac Nuevo, Iloilo, formerly an engineer of this Bureau, is now with the 108th Engineers U. S. Army. According to latest news, his company will go to France.

Mr. G. B. Canaga, formerly designing engineer, is now with the Emergency Fleet Corporation, Washington, D. C.

Messrs. Henry Damon and C. N. Conner, formerly engineers of this Bureau, are now in the Bureau of Yards and Docks, Navy Department, Washington, D. C.

Mr. J. C. Sophian, formerly an engineer of this Bureau, is with a contracting firm in New York.

Messrs. T. Warren Allen, W. P. Linton, E. W. James, H. V. Miles, J. L. Harrison, formerly engineers of this Bureau, are now in the Office of Public Roads, Washington, D. C.

Mr. D. E. Henry, former chief constructing engineer, is in Portland, Oregon.

Capt. W. H. Waugh, formerly division engineer, is in Alaska.

Mr. C. G. Morrison, formerly district engineer of Pangasinan, is also in Alaska.

Capts. W. C. West, W. C. A. Palmer, E. J. Halsema, E. C. Brown, A. D. Williams, W. J. Grodske, jr., A. R. Pease, S. W. Hulse, A. G. Yankey, P. W. Mack, and First Lieut. M. C. Collins, engineers of this Bureau were summoned to take the first available transport and proceed to Camp Lee, Virginia, where they will receive their training in military tactics.

Mr. Romarico Agcaoili, recently supervising engineer of this Bureau, is now locating engineer of the Manila Railroad Company, Manila.

Capt. F. T. James, recently supervising engineer and now with the National Coal Company, Manila, has been ordered into active military service.

Col. G. G. Stroebe, Captains Marcial Kasilag, Valeriano Segura, Vicente Fragante, Second Lieutenants Manuel Gonzales and Isaias Fernando, engineers of this Bureau, are now in the engineer corps of the Philippine National Guard.

Capt. Jose A. B. Corpus, superintendent of the Benguet Auto Line, is also in the engineer corps of the Philippine National Guard.

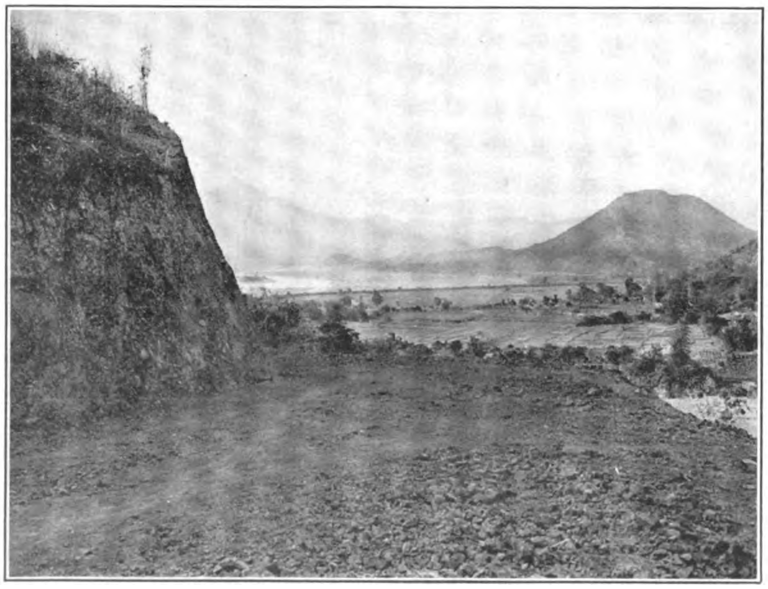
Capt. C. A. Barretto, of the architectural division, is also in the engineer corps of the Philippine National Guard.

PROJECT NOTES BY DISTRICT ENGINEERS.

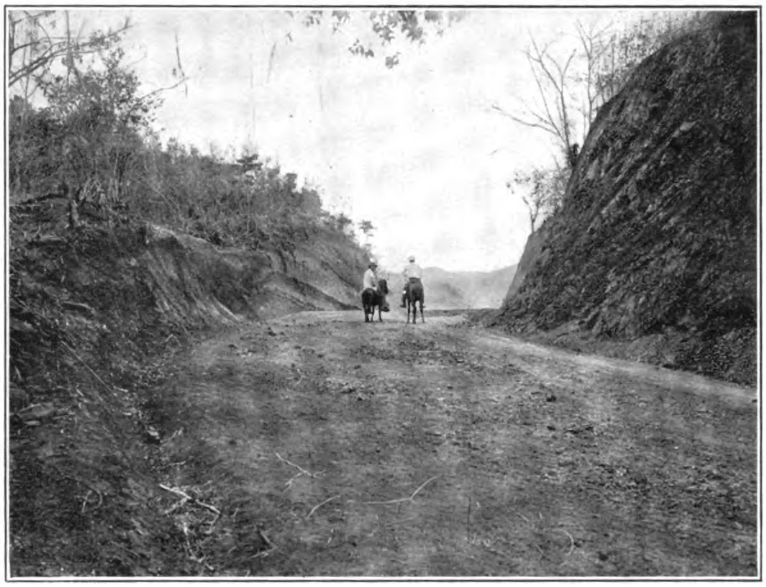
ABRA.—The construction work on the Bangued–Tañgadan Road is progressing nicely. Of the 19.4 kilometers which correspond to Abra, the subgrade is near completion on the entire section, and the gravel has been placed on kilometers 5, 6, 7, 8, 9, 10, and 11. This is one of the most important projects in northern Luzon as it is an interprovincial road connecting the Province of Abra with the Province of Ilocos Sur and the Port of Sulvec. When this road is completed, it will surpass the Naguilian Road by far in scenery. Insular aid is needed to help the provinces of Abra and Ilocos Sur to complete this project, otherwise work will have to be stopped in the near future.

The entire 10 kilometers of subgrade has been completed on the Bucay-Peñarrubia Road with the exception of 400 lineal meters on kilometers 5 and 6, gravel is being placed at present and the entire road is expected to be completed by December 31 of the present year.

Investigation and survey has been made on the Tayum–Lagañgilang Road, same have been plotted, but no work will be commenced until after the rainy season.



Kilometer 18 showing heavy side hill cut, Bangued-Tañgadan Road. "Abra Side."



Kilometer 15 showing heavy cut, construction Bangued-Tañgadan Road. "Abra Side."

All first-class roads have been maintained as in the past, same being in excellent condition.

Investigation will be made in the near future pertaining to the construction of a water system for the municipality of Bangued.

AMBURAYAN (subprovince).—An allotment has been made by the Insular Government, amounting to ₱50,000, for the construction work of the road north of the municipality of Tagudin; a portion of same will be put under construction in the near future as it is of a sandy formation and can be worked during the rainy season.

AGUSAN.—Construction of the telephone line from Nato to Talacogon, which is 85 per cent completed, is at present at a standstill due to lack of wire. The work will be resumed again as soon as the material ordered from the Bureau of Supply is received.

The surfacing work on the Butuan–Cabadbaran Road, which was stopped during the months of April and May for lack of laborers, has been resumed, and the work is progressing very satisfactorily. At present, stones and river gravel are being hauled 6 kilometers from the source of supply. This distance will be increased to 9 kilometers before the surfacing work is completed. Two and half kilometers of subgrade has been reconstructed and is now ready for surfacing. One man has been sent to Cebu to import laborers for road construction. At present there is only an average of 24 men a day working on the road. The construction of the remaining 7.5 kilometers of subgrade was advertised and one bid received from one of the contractors in Cebu. This bid is now pending approval of the Provincial Board.

The clearing for the construction of the Butuan–Nasipit Road will be started about the first week of July. It is hoped that the subgrade work can be started in the near future.

The work on reinforcing of bridges from kilometer 14 to kilometer 28 on the Butuan–Cabadbaran Road is now completed and the structures are open for traffic.

The construction of the Butuan Hospital will be started about the 1st of July. A great difficulty was encountered in turning out lumber for the construction, as the sawyers in this province refused to do the sawing on account of the present price of abaca.

The construction of trails in all municipal districts is at a standstill due to excessive rain in that part of the province.

Public works in this province are badly handicapped due to shortage of labor. Local laborers are hardly obtainable. They prefer to work in the hemp field where a common laborer can earn two to three pesos a day than to work for the Government at lower wages.

Last January the district engineer went to Cebu and directed personally the campaign of importing laborers to Agusan por public works. Laborers in Cebu are not now so abundant as they used to be. Three years ago they could be secured anywhere in the province, and as many as one desired, at a rate of 40 centavos a day. Hundreds of them poured into the city of Cebu looking for work; but now the condition has changed. Labor is scarce and the wages are much higher than they were formerly.

ALBAY.—The construction of subgrade of the Polangui–Libon and the Legaspi–Daraga via Gogon road was started after the Holy Week, preceded by extensive propaganda of the new rate of 80 centavos for common labor, instead of the old rate of 60 centavos a day. There are about 250 men engaged now on the two roads, and the number is increasing every day.

The resurfacing of Tabaco–Wharf Road has been completed, and that of kilometer 28 and 29, Tabaco-Tiwi Road, is also nearing completion. The resurfacing of the Agus section of the interprovincial road to Camarines has been going on very slowly on account of the failure of the contractor to secure sufficient labor and carts to haul stones. It is expected, however, that it will be completed before the end of the month of April, as only the last kilometer remains undone. Progress is very slow also on the resurfacing of the Legaspi–Daraga Road with Camalig stone, because of lack of sufficient number of bull carts to transport the stone to the railroad station in Camalig and from the distribution stations in Albay and Legaspi. This difficulty will be solved as soon as the three Ford trucks ordered by the province arrive.

The construction of the Virac–Calolbon Road in the subprovince of Catanduanes has been recently started, and present indications show that a sufficient number of laborers will be had all the time on the job.

Bids for the construction of Daraga Market 21 by 39.8 meters, type A, have been received and forwarded to the Director of Public Works for action. Only two bids were received in the province and both of them were very high.

An insular loan of ₱30,000 has been secured for the erection of another market building in Tabaco.

No bids having been received for the construction of the Tiwi presidencia and for the completion of the Polangui School, the work will be done by administration.

Advice has been received from the division superintendent of schools that money is available for the erection of a standard No. 7 school building in Camalig and another in Jovellar.

AMBOS CAMARINES.—The great shortage of labor in this province seems not to be due to lack of men, but to the failure of the men to put in full time. Wages are so good that they do not have to work full time to make a living.

Due to continuous rains and scarcity of labor, very little road work has been accomplished during the first quarter of 1918. Grading has been continued on the Pili–Tigaon Road with a small force. Work on this road is progressing well considering the scarcity of labor. Automobiles can now go through to the Partido, but have to pass over about 3 kilometers of unsurfaced road. It is hoped to get this section closed up by September. A rinderpest quarantine has hampered the work somewhat, and necessitated blasting the boulders along side of the road for surfacing as transportation could not be secured for hauling the proper size of stone. The boulders blasted were too large and hard to break by sledges and too small to drill or to blast economically. However, as there was no other means of getting stone, the larger boulders were drilled and blasted and the smaller mudcapped and blasted. Mudcapping does not require so much labor but the present prices of explosives make this an expensive method of breaking stone.

Resurfacing on the Daet–Mercedes Road in north Camarines has been started. After many transportation difficulties the stone is now coming along at a rate that will permit fair progress. The main difficulty now is to get men to do the work. The rate is ₱1 per day, and the average daily number of men working is about twenty.

Building work in this province is almost at a standstill on account of lack of materials, especially around Naga. There is only one ship calling regularly at Naga now and that is not sufficient to supply the needs of the merchants.

A special allotment of ₱75,000 was made on March 20, 1918, for the reconstruction of the Naga–Pasacao Road. Besides opening up a vast amount of fine agricultural land, this road when completed will give the Bicol Provinces excellent connection with Manila. When complete the route from Sorsogon to Manila will be as follows:

From Sorsogon to Legaspi over the interprovincial road now under construction; From Legaspi to Naga over the Albay–Camarines Interprovincial Road, now complete, or over the railroad, which requires for completion the laying of about 30 kilometers of rails; from Naga to Pasacao over the Naga–Pasacao Road, 25 kilometers, which is now under construction; From Pasacao to Guinayangan by boat, about 4 hours; there connecting with the railroad for Manila. At present the connection between Naga and Manila is via launch and steamer to Hondagua, and during the northeast monsoon this trip is dangerous and uncertain.

ANTIQUE.—An appropriation of ₱25,000 had been made for the construction of Antique–Capiz Interprovincial Road and steps have already been taken to secure a road roller to be used in the construction of this road; 50, of the 170 tons of coal requisitioned this year, will be assigned to this project, and the work of collecting materials for first course will soon be started.

Materials for 2 box culverts, 4 temporary wooden trestle bridges, and 11 concrete pipe culverts will soon be requisitioned for the construction of these structures, along the projects Sibalom–San Remigio–North, San Jose–Dao, and maintenance of first-class roads. The temporary bridges will be built solidly and roofed to last for 10 to 20 years.

A survey of the Culasi–Bitadton section, a distance of 9 kilometers, will be made in the future and the line cleared to afford a convenient third-class road to traffic in dry weather.

The survey of the tract for the townsite of San Remigio has already been started.

The survey and gauging of the Sibalom River at the barrio of Bubuñgan has been completed.

Work on the domestic-science school building was resumed and 50 per cent of the work completed, but owing to lack of funds, the work has again been suspended.

Four thousand six hundred and eighty-six trees have been planted along the first-class roads, 1,046 trees along the San Jose–Sibalom Road 1,470 trees along the San Jose–South Road, 466 trees along the San Pedro–Sibalom Road, and 1,704 trees along the San Jose–North Road. One thousand four hundred and one trees were pulled out by vandals and consequently died.

Investigation and survey of the San Jose Wharf has been completed.

Work has been resumed on the construction of the San Jose Market Building.

Owing to scarcity of labor in this province during the first half of 1918 public works have been practically at a standstill.

It was the plan this year to have 6.5 kilometers of first course metalling completed on the Antique–Iloilo Interprovincial Road. There are 6.5 kilometers of graded road which only need to be widened out in some places, some of the steep grades reduced and thorough drainage provided.

To start this work, it becomes imperative to discontinue the work along the North Road on the other side of the Paliuan River.

The 10-ton Kelly road roller and 18 tramcars with 4.5 kilometers of tramways engaged in the construction of the North Road were transferred to this project and the hauling of this equipment from Paliuan to the interprovincial road, a distance of 58 kilometers, was a serious problem, in view of the three big rivers that it had to cross on its way, besides the work that had to be done in reinforcing the numerous wooden structures, specially those bridging certain long and deep rivers found along the road from Bugasong to San Jose.

On February 26 a requisition of 170 tons of coal was made for the use of the three active projects: Antique–Iloilo Interprovincial Road, Malandog–Sibalom Road and Antique–Capiz Interprovincial Road, but owing to difficulties in transportation the first shipment of 60 tons was received on June 2, 1918.

A little over one-half of the materials needed to complete surfacing with first course material on 6.5 kilometers of road, has been collected during the past six months. These will soon be hauled to place, spread, and rolled.

A solid wooden trestle of three spans, forming a bridge 15 meters long, has also been built aross the Calacha River. This bridge, built of first group materials, will have a life of from 10 to 20 years if properly maintained.

The expenditures on this project during the past six months were ₱22,700, including obligations, and the expenditure for labor was ₱8,300. There is at present a balance of about ₱18,000 on this project, and 2,500 cubic meters of first course material to be collected. Hence about ₱2,500 will expended in the collection of gravel, ₱8,000 to bring the materials in place, which leaves a balance of ₱7,500 to be used in widening the road in some places, provide it with ditches, and construct the first course metalling for 6.5 kilometers of road.

The ₱18,000 balance might be sufficient for the rest of the year should labor conditions continue to be as they are at present, otherwise the balance will not be enough to complete all the work which has been detailed above.

An appropriation of ₱9,449 was made at the beginning of the year to commence construction on Malandog–Sibalom Road, besides the ₱4,660 regular allotment which was lately assigned to the project. It was the intention to make this a first-class road, but owing to scarcity of materials and labor difficulty, it has been decided to build it as a second-class road. The length of the road is 10.5 kilometers.

Two and five-tenths kilometers of this road will have to be supplied with materials from the Sibalom River and the longest haul is 10.5 kilometers. Two five-kilometer tramways and 8 tramcars have been engaged this year on this project, and it was planned to collect, during the last dry weather, materials to surface 6 kilometers of road, however, the scarcity of laborers made such plan impossible to carry out, with the result that the work on the project will have to be suspended in the near future, and whatever appropriation is left will have to be turned to some other project.

There are already two kilometers of first class road completed and materials enough on hand to build about 1.5 kilometers of second-class road.

A wooden trestle of 7 spans, 5 meters to each span, is also under construction on the Catungan River; the materials are yacal, lauan, and tuog for the posts with cogon roof. Such bridge will have a life of 10 to 20 years if properly maintained.

Lack of hauling facilities is another problem in the construction of roads in this province.

Owners of bull carts seem to lack interest in public works. They would rather stick to the routine work of hauling nothing but the few cargoes of certain Chinese merchants in the province, where they can make ₱3 in 4 hours work by hauling 1,485 pounds of cargo a distance of 10 kilometers, as often as once a week.

To promote the interest of owners of bull carts in public works, it has been announced that within a radius of 8 kilometers from San Jose, the following list of prices per cubic meter for hauling surfacing material will obtain:

Km.		*Km.*	
1.	₱1.00	6.	₱2.79
2.	1.25	7.	3.22
3.	1.50	8.	3.64
4.	1.93	9.	4.07
5.	2.36	10.	4.50

It will be observed that for the longest haul, a cart loading one third of a cubic meter, or 1,085 pounds, could easily make one trip during the day without tiring the animal, and in that way the animal could be made to work every day and earn in a week the amount of ₱9, which is 3 times as much as they can earn at present in a week; while the wear of the animal is practically nothing, provided the animal is well taken care of, and well fed.

Should there be 100 bull carts, for the longest haul, it will take 22 days to deliver 720 cubic meters of first-course material to the road, which is the amount needed to surface 1 kilometer of road with an 18 centimeter thickness of first-course material, and it will take, therefore, one month to surface, with first course the farthest kilometer of road, once the materials have been collected.

The cost of collecting and hauling the materials to the storing place is ₱1.50 a cubic meter. Hence the cost of collecting and hauling material to the farthest kilometer is ₱6.50 per cubic meter. The cost of collecting and hauling for the nearest kilometer is ₱2.50 per cubic meter. Hence the cost of collecting and hauling first-course material for a maximum haul of 10 kilometers is ₱4.25 and the average cost per kilometer of collecting and hauling materials is ₱3.60. Therefore it will cost ₱4,000 to surface a kilometer of the Sibalom–Malandog Road with first-course material.

It is hoped that the new schedule of prices for hauling will solve the transportation difficulty, which has engaged much thought on the part of the board, and this office. The opportunity to earn from ₱9 to ₱19 per week should prove attractive to bull-cart owners.

BATAAN.—Construction of the Orani Market was completed during the first quarter of 1918. This market is a standard plan, size 15 by 31 meters. Its cost was ₱12,000.

The Hermosa–Dinalupihan Road is being drained with concrete pipes. This road is an unsurfaced one and during the rainy season it usually becomes impassable, but with the present culverts, in place and with the subgrade repaired on the portions damaged by the rain, it is expected that it will be in better condition than in former years during the rainy season.

The Lubao–Hermosa Interprovincial Road was opened to light traffic during this quarter and the construction of a wooden bridge at kilometer 105.4 on the same road was started during March. A temporary bridge was built to care for traffic during construction.

Two more temporary bridges were built on the Bataan section of the Pampanga–Bataan Interprovincial Road. One at Puslac, kilometer 103.2, and the other at Balsic, kilometer 105.6. Another temporary bridge is under construction on the Laokpao River and is expected to be finished during the first quincena of July 1918.

A good quality of gravel is being placed on the Bataan section of the interprovincial road, beginning at Balsic Bridge, the gravel pit being situated about 3 kilometers from the Layac collapsible bridge, which is the origin of the road to Pampanga. About 400 meters of the road at the entrance to the town of Hermosa were already surfaced and rolled.

The continuation of the Balanga–Puerto Rivas Road was started in February. This road will end at the barrio of Puerto Rivas, and it is expected that it will be a great improvement for that barrio.

The portions of the Orion–Limay Road in the sitios of Mantigbe and Pandan are being surfaced. These portions of the road become very muddy during the rainy season, but it is presumed that with this surfacing, the road will be passable throughout the year.

The provincial government building has been provided with galvanized-iron eaves, which besides giving protection to the windows against the action of the rain, enhance the beauty of the building.

A beautification plan is being followed in the improvement of the plaza in front of the Government Building, and its surrounding. A band stand made of adobe and cement was built in the center of the plaza and the ground surrounding it was covered with grass and flowers. Its appearance is very attractive.

The section of second-class road through the municipality of Pilar was greatly improved as well as the muddy sections on kilometers 9.3 and 12.4 of the Balanga–South Road, which were surfaced with gravel and crushed rock respectively to make the South Road passable during the rainy season.

The Balanga–Bagac telephone line operated successfully during this quarter and to the satisfaction of the Bagac people.

Two outhouses and a small wooden bridge for the Balanga Primary School were finished during May 1918.

BATANGAS.—An additional appropriation of ₱10,000 has been made for the construction of the Alitagtag–Cuenca Road. With this amount, it will be possible to extend the completed section 2.5 kilometers, leaving 5 kilometers only for future construction.

A good location for the Rosario–Bolbok Road has been found but construction work is somewhat delayed due to difficulties in securing right of way. It is believed that these difficulties will soon be satisfactorily overcome.

Five and one-half kilometers of the Batangas–Tayabas Interprovincial Road from Bolbok to Candelaria have been graded and stone is now being prepared for surfacing same.

The Bauan Market, a standard building, 39.1 by 24 meters in size was completed on March 23, 1918, at a cost of ₱22,071.

The construction of the Nasugbu and Balayan Markets is being somewhat delayed due to lack of part of the roof truss timbers. The columns have been completed and part of the trusses are being placed. These markets will be completed in the near future.

During the second quarter of 1918 the following special allotments were granted the province of Batangas for road construction:

Bolbok–Candelaria Road	₱40,000
Tanauan–Talisay Road	35,000
Lipa–Balete Road	20,000

Due to the rice-planting season and to the high wages offered laborers on the Laguna sugar plantations, there are now very few laborers working on the Bolbok–Candelaria and Rosario–Bolbok Roads. A raise in wages has been decided upon and it is hoped that a large number of laborers will be available as soon as the rice planting season is past. The above also applies to the work on the Tanauan–Talisay Road, but surfacing work is going on steadily as fast as stone can be obtained from Los Baños.

The opening of the Lipa–Balete Road will afford a market for the fish from Lake Taal as well as an outlet to the railroad for the sugar and abaca raised in this section. The road will also facilitate visiting of Lake Taal by tourists.

The Nasugbu and Balayan Markets are now nearing completion.

The Alitagtag Standard Plan No. 4 school building is now being painted and will be turned over to the school authorities very soon.

The construction of the Bauan School is going forward slowly, being handicapped by lack of funds. It is expected that six rooms can be made available for school purposes before having to suspend the work. The school when finished will consist of 16 rooms of a standard 20-room building.

Materials for the Cuenca Standard Plan No. 4 school building have been ordered.

The Cuenca Waterworks which was dedicated during the town fiesta of May 15, 1918, is now completed and will soon be turned over to the municipal authorities.

Advertisements calling for bids for construction of Batangas water system have been posted. The work will consist of constructing one concrete reservoir, installation of one pumping engine and pump and part of distribution system in the poblacion of Batangas. Forty-five thousand pesos are available for this project of which ₱15,000 are an insular loan and ₱30,000 are alloted by the Insular Government.

Several road sections were washed out by the rains of the latter part of June. These will be repaired immediately.

The Taal Municipal Electric Light System is now being successfully operated, there being more than seventy private houses connected to the system as well as 120 street lights. The system is being operated from sunset to midnight.

BENGUET.—The Benguet Auto Line handled during the period from April 1 to June 30, 1918, 1,026 first-class passengers, 1,271 third-class passengers, 330,794 kilos of hand baggage, and 62,831 kilos of express and freight.

Summary of Traffic over the Benguet and Naguilian Roads from April 1 to June 30, 1918.

Name of road.	Pedestrians.	Bull carts.	Animals led or ridden.	Calesas.	Motorcycles.	Automobiles, passenger.	Automobiles, truck.	Wagons.
Benguet Road	2,482	1,873	286	--------	21	1,800	950	--------
Naguilian Road	1,975	4,037	946	49	54	1,388	967	541

The first-class road system of the city of Baguio will be increased by 8.5 kilometers of first-class road during 1918. Roads formerly designated third-class are to be re-graded and surfaced as follows: Outlook Drive, Bokawkan Road, Cemetery Road, Otek–Cariño Street, and Wright Park Road.

The completion of the Baguio Market has been delayed due to the contractor's inability to furnish lumber required for roof trusses. Work has been started on the construction of 70 lineal meters of animal sheds, 3 meters wide, at Market Plaza. The building is to be constructed of masonry with a clay tile roof, and ₱12,000 is available for the project.

The construction of the 300,000-gallon reinforced concrete water tank for the Baguio Water Supply System will be completed during the month of April.

Girls' dormitory at Teachers' Camp, will be ready for occupancy on April 10. The building has 948 square meters of floor area and will be a valuable addition to the Teachers Camp Plant. The plans for this building are a modification of the plans of the San Lazaro ward for the aged and infirm and the Zamboanga Hospital. The columns are constructed of cut stone, which is very effective in contrast to the red tile roof.

Six and six-tenths kilometers of the Bua and Trinidad Roads in the subprovince of Benguet have been recently declared first-class.

Work is under way on the construction of presidencias for the townships of Trinidad, Atok, and Pugo, subprovince of Benguet.

Work was started on a Standard Plan No. 7 wood school building similar to San Nicolas, Pangasinan plan at the Trinidad Farm. A shop building and a suspension bridge are now projeted for the near future.

The extension of Bua Road to the landing of the Benguet Consolidated Mining Company is now under construction.

Surveys were made for an extensive drainage and irrigation systems for the Trinidad Valley. Both systems are feasible and will be constructed as soon as funds are available.

Lack of transportation seriously delays the completion of the public market building, the concrete water tank, and several road construction projects around the city.

The Trinidad Presidencia, standard plan 8.1 by 16.0 meters, two-story building constructed of Benguet pine, with galvanized-iron roof, is 95 per cent completed.

During the past quarter, many of the timber trestle bents on the Benguet Road have been replaced by masonry walls and culverts. More than 300 meters more should be replaced during the next few months at an estimated cost of ₱30,000, but due to lack of funds this work must wait for the new appropriation. Tolls on this road from January 1 to June 30, approximate ₱18,000.

Plans have been made and approved and ₱25,000 appropriated for a new wing on the Hotel Pines. Work will be started about July 15.

BOHOL.—Due to delay in the arrival of lumber for the Maribojoc School, Plan No. 10 of the Bureau of Education, the construction cannot be completed so as to be used on the opening of the school year.

Funds have been made available for the construction of Valencia Central School, Bureau of Education Plan No. 7, materials for which have been requisitioned and which will soon to be under construction.

The construction of the Loay–Interior Road is progressing slowly due to lack of laborers; however, means have been made to raise wages and more laborers are gradually coming in.

The construction of the Tauran Bridge is almost completed and will be opened for traffic by July.

The construction of Loay waterworks has been completed, and it was turned over to and accepted by the local authorities. Requisition has been made for pipes and fittings to make installations to the houses. Due to lack of funds of the municipality of Duero, applications for house connections cannot be undertaken; however, as soon as appropriations are approved, steps will be taken to proceed with this installation immediately.

The construction of four additional rooms to the Provincial High School has been started and if other materials are received on time, it is presumed that within two months, this will be completed.

Requisitions for the materials were made for the construction of Bacani and Bagiang Bridges and, upon their arrival, construction will be started.

Preliminary plans and data for the proposed Inabanga Bridge have been submitted to the Bureau of Public Works; ₱10,000 were set aside for this work.

Construction has been started on the Balilihan–Bahian Road, part of the funds for which are municipal. The completion of this road undoubtedly will reduce the cost of transportation from the town of Balilihan to that of Cortes, Bahian being the approach to the river that connects these two towns.

Pending the receipt of plans from Manila of the proposed Dauis Bridge, this project is at standstill.

The construction of the proposed Tagbilaran Causeway to the future wharf will soon be under way. The completion of this project will certainly make an invitation to even large steamers to call at Tagbilaran ports.

The construction of the Guindulman–Cogtong Road is very slow due to scarcity of laborers; however, efforts are being made with the coöperation of the local authorities to procure sufficient laborers to accelerate the construction of this road.

Early this month the construction of the Quinoguitan–Sevilla Road, a section of about 5½ kilometers, and a feeder road to the Loay Interior Road from the town of Sevilla, was started. More funds will be voted for this project. The completion of this road will bring the numerous products from the town of Sevilla and its neighboring barrios to the port of Loay, and will increase the value of the land through which it passes.

The construction of the second story of Loboc School is awaiting more funds from the municipality to complete the project. The same is true of Bilar Farm School, part of the materials for which have been received. In regard to the Loboc School, an effort is being made to raise local funds by voluntary contributions.

A plan has been prepared by this office to construct a provincial warehouse, requisition for materials for which has already been made.

The construction of the Dauis waterworks is almost completed. This is a branch of the Tagbilaran waterworks. Its completion will undoubtedly be very beneficial to the town.

Funds have been secured for the construction of the Macaas Bridge.

The municipality of Jagna has passed a resolution setting aside ₱10,000 to meet one third of the cost of its proposed water system. Plans for this are now in preparation in the Manila Office.

Investigation for water supply in the municipalities of Carmen, Tubigon, Garcia-Hernandez, and Loon have been made, and will soon be submitted to the Central Office.

BUKIDNON.—The first quarter of the year saw the opening to automobile traffic of the road from Kulaman Canyon, Maluco, through the towns of Impasugong, Impalutao, Dalawangan, Kalasungay, Malaybalay, and up to Mailag. This is the result of the continuous efforts of the provincial governor of Bukidnon, not only to procure labor but to supervise personally part of the work. With the completion of a provisional bridge which is under construction across the Malupali River near Mailag, automobiles will be able to reach the new barrio of Dagumbaan where the Crescent Star Cattle Ranch is located, thus making possible a trip by automobile of 150 kilometers from the port of Cagayan to the interior of Bukidnon, with only the Kulaman Canyon to cross afoot or on horseback. Almost all the road throughout this long distance is on the final location with very few places, such as bridge sites, to be relocated.

In making the improvement, as much care as possible was taken to build the road on the right location where it has been surveyed, and where it has not yet been surveyed, to select the probable best location, and build the road thereon. Just beyond the Kulaman a clearing has been made about 6 kilometers long, along side the old trail, so that the automobiles may make connection with the old trail across the canyon, while the road on the new location is being opened. So at present it is possible to make an inspection in one day of all roads of Bukidnon from Dagumbaan to Cagayan, and from Cagayan to Uguiaban, on the Malaybalay–Western Misamis boundary road, a distance of 175 kilometers.

To maintain this great length of road drags are being constantly used except in rocky and stony places like those sections along the Atogan and Mangima Canyons and on the Malaybalay–Western boundary section. Maintenance gangs of ten men under a capataz are also employed, on sections where slides occur, to keep them open to traffic all the time, as the almost daily afternoon rains produce constantly big slides, specially on newly build roads along hill sides and canyons.

With the desire to build as much road as possible, and also to put old roads in good condition during this seem-to-be dry season of Bukidnon, and with the lack of transportation facilities, much delay has been incurred in the opening or prosecution of other projects.

However, whenever the cart bulls are freed of other work, materials are being constantly transported for the Malaybalay waterworks and the Malaybalay teachers' office and residence. It is hoped, however, that with the acquisition of a one-ton Ford truck attachment by the province, and with the probable increase in the near future of 30 more bulls for the transportation equipment of the district engineer, an impulse to transportation will enable this office to begin work on the projects above named.

On account of the appearance of hoof and mouth disease among the cattle in the province, including most of the bulls assigned to public works, and the establishment of quarantine stations between almost all the towns from Misamis boundary to Malaybalay, there has been an almost complete paralyzation of the prosecution of public works in this district during the last quarter. The few available animals that were not infected or that were able to recover promptly from the disease had to be utilized to transport rice, not only for the laborers working on roads and bridges, but also for the employees in Malaybalay.

The only construction work worth mentioning that has been carried out during the term is that of a provisional bridge built over the Malupali River near the town of Mailag. This bridge is a 90-foot span, five-panel Howe truss type. The lumber used was provided locally from neighboring forest and belongs to either the first or second groups. The bridge was designed to carry 6-ton loads. The bridge site is the best that could be found; it was selected by the governor, inspected, and with the bridge design, approved by the supervising engineer in his visit to Bukidnon in April. The bridge is 15 feet high above low water and about 5 feet above extreme high water according to information of people living in the neigborhood. With three good coats of local tar and the bolt holes and cracks puttied, it is thought that the bridge may last at least ten years, provided care is taken to renew the cogon roof every two years. The bridge cost about ₱2,500 including all expenses, such as cutting, transporting, and sawing lumber. The bridge is regarded as a very important one as it opens up to wheel traffic the rich agricultural region of Mailag, which at present produces almost half of all hemp exported from Bukidnon, and in the near future, after the colonies have arrived there, will supply all the rice that the province needs.

The bridge also facilitates the trip to the Government cattle ranch as automobiles can now reach the town of Lurugan, which is hardly a day's ride to Dagumbaan, where the ranch is situated.

BULACAN.—Filling on the Baliuag–Candaba first-class road construction, 6.8 kilometers in length, has already been completed together with 2 kilometers of surfacing. Metalling on 3½ kilometers has also been done.

The construction of Baliuag–Maasin Road, as first-class, from kilometer 57 to kilometer 62 is now under way. Widening to 4-meter metalling on the roadbed of this section was done. Work on this project actually began about the middle of May, 1918, and there has been slow progress due to the widespread rinderpest in this province, which causes the delay in gravel hauling.

The proposed second-class road from the poblacion of San Ildefonso to its railroad station, having a total length of 1.8 kilometers, has been surveyed. It is estimated that ₱6,000 will construct this road. The amount of ₱2,000 from general funds has been appropriated to start the work on this project.

Polo–Novaliches and Obando–Malabon roads, 5.3 and 1.9 kilometers in length, respectively, has been surveyed, and also the interprovincial bridges on these sections.

There is being constructed on the Pulilan–Calumpit Road a concrete spillway 600 meters long. Construction was started during the last days of June, 1918. The sum of ₱10,000 has been appropriated for this work.

The amount of ₱20,000 has been alloted to this province for the construction of trail between Sibul Springs and Biacnabato. This new section, 8 kilometers in length, has also been surveyed.

The Malolos–Santa Isabel–Guiguinto second-class road was resurfaced and is now opened for traffic. Through this route, 2 kilometers are saved in going to Malolos from Manila.

Fifty per cent of the Malolos–Calumpit road via San Marcos has been resurfaced and the remaining half will be completed this month. When this road is completed, 15 kilometers will be saved in going to Calumpit from Malolos over the other route.

The Maasin River concrete weir for hydrographic survey was completed for the above purpose.

Metalling on the Santa Maria–San Jose Road, 1.3 kilometers in length, was completed during this month.

False work on the Santa Maria Bridge construction is nearly finished. The driving of concrete piles will be started before the end of June, 1918.

The San Rafael school building, which was built after the Standard Plan No. 7 of the Bureau of Education (wooden type) has been completed and occupied since the beginning of the present school year. Cost complete ₱14,500.08. The construction of the Calumpit school building, Plan No. 20, Pasig Type, is being delayed due to lack of funds, and also because of the slow delivery of materials. The construction of Standard Plan No. 7 school buildings will be undertaken in the month of August in the municipalities of Polo and Pulilan. Requisitions for these two schoolhouses are being prepared.

Requisition for materials for the construction of a standard school building in the poblacion of Bulacan has been made out and forwarded to Manila. This building will be a Standard Plan No. 10 (wooden type) of the Bureau of Education.

A wooden bridge will be built to span the Bunsuran River, which will replace the old structure.

CAGAYAN.—Automobile traffic is developing in this province and therefore greater efforts will have to be made in order to keep the roads in good condition.

An additional appropriation of ₱30,000, by Insular allotment, has been made available this year for the construction of the interprovincial road between Claveria and Bangui. Big forces of laborers are working on this road and the work is being pushed at an amazing rate of speed.

Work on the Claveria–Bangui Road is progressing very nicely. From 300 to 400 men are being employed. Five kilometers are already finished and more work is expected to be done before the rains set in.

Repairs and painting of the Aparri primary and intermediate Schools have been completed.

The work on the construction of the wall at the Aparri Port is progressing satisfactorily. Groins Nos. 1 and 2 have been already completed, and more than 60 per cent of the third groin was finished during the month of May.

Two kilometers of the Aparri–Lallo Road have been thoroughly rolled during the last quarter and subgrade has been completed up to kilometer 11. Twenty-four concrete pipes were built. Seventy-seven per cent of the regular allotment for this year, or ₱17,233.37, has been appropriated for this project.

An allotment of ₱25,000 has been made available for the construction of hurdles on the Cagayan River near the barrio of Canayun. This hurdle is to concentrate the current and keep the bar at the entrance of the river open. Advertisement has been made for furnishing Palma Brava piles.

The construction of the Tuguegarao–Alcala Road is now practically all completed up to the municipality of Alcala on kilometer No. 39. The road roller will be moved to the Tuguegarao–South Boundary Road.

The construction of Comercio Street in the municipaity of Alcala will be finished within a few days.

A special allotment of ₱40,000 was made for the construction of the Tuguegarao–South Boundary Road. The project is now under construction. The subgrade has been completed to kilometer 7.

The Solana Central Barrio School Building was completed, and occupied at the beginning of the school year.

CAPIZ.—The greatest and highest flood during the last fifty years in this province occurred from December 24, 1917, to January 10, 1918. The Aclan River and the Sooc Creek formed one great, wide, and swift river carrying away thousands of pesos worth of property and crops.

The progress of construction on the Mianay–Sigma and the Navas–Antique boundary first-class roads has dropped decidedly due to lack of laborers. Only 3 out of 9 kilometers have been completed on the former, and 2 out of 5.7 kilometers on the latter.

Location surveys have been recently completed for the Loctugan–Ivisan Road. Plan, profile, and estimates for same are being prepared for submittal for approval to the Manila Office. Thirty thousand pesos special allotment are available for this project.

Seventeen kilometers of second-class roads are undergoing construction in this province with a first-class road subgrade. Seven out of 9 kilometers of grading are completed on the Ibajay–Navas Road; 4 out of 5 kilometers on the Banga–Sigcay Road; and all the 3 kilometers on the Banga–Malinao Road. Gravel is being placed on the completed grading, 2.5 meters wide by 15 centimeters thick.

The Sooc Creek low concrete bridge, a 5-meter box on concrete pile bents and with concrete road approaches, was completed, inaugurated, and opened to traffic on May 19, 1918, at a cost of ₱8,500. The completion of this concrete road structure has opened up the automobile traffic between New Washington and Ibajay, 46 kilometers apart.

There are two school building projects under construction in this province at present. The Loctugan Barrio School, Plan No. 3, complete with nipa roofing and no ceiling, will cost ₱7,000, and will be occupied in the course of a few days. The other is the Capiz Central School, partial Plan No. 20, which is just started.

Bridge No. 3.6 on the Calivo–Ibajay Road was damaged by the flood of January. The north side of both abutments sank nearly half a meter and all the back fill washed away. After the flood, the bridge was cribbed and four 2½-inch jackscrews were used to lift the superstructure to its former position, and concrete was added on both bridge seats. To protect against future similar scour, coconut piles were driven all around both abutments and under the bridge on the downstream side, and boulder riprap placed. This was done very economically and put the bridge in first-class condition ten days after it was damaged.

Work has been started on the construction of the Navas–Pandan Interprovincial Road by the "paquiao" system. This method of work was adapted due to scarcity of labor. Two kilometers of grading have been completed to date. To connect up this road with the Calivo–Ibajay Road, a second-class road with a first-class subgrade is under construction between Ibajay and Navas. The work is also under the "paquiao" system. Five hundred meters of grading have been completed to date on this road.

CAVITE.—Work on the San Roque–Cañacao Road has been suspended, as funds are exhausted. This year a special allotment of ₱25,000, was set aside for this project, but it was paid for the ₱25,000 loan to San Roque–Cañacao Road given last year.

The work on the Naic–Indang Road is progressing rather slowly for lack of transportation of road materials from Naic railroad station. The materials come from Los Baños quarry to Naic and are then transported to the work by carts and trucks on a 17-kilometer haul. Hauling costs ₱0.50 per cubic meter per kilometer and even at these high prices, no carts can be induced to haul, as by hauling hemp, cart owners can at least earn ₱10 a day. Cavite hemp has gone as high as ₱105 per picul. Laborers are also scarce, as people can go up to Indang, Mendez, Alfonso, and other hemp producing towns and earn more than four times what they can earn on the road.

The repair to the Culong–Culong Dam has not been finished yet as was expected. Work was suspended for two months due to exhaustion of funds. At the end of June heavy rain had fallen, thus retarding the work, besides causing serious damages as a consequence.

Work on the Cavite garbage incinerator has not yet been finished. No funds for labor to complete it.

Work for the Alfonso school has not yet been fully started as transportation is scarce.

Transportation cost in the hemp district of the province has gone as high as twice what it was last year.

A market 18 by 38 meters is being constructed in Indang. There is also a market 15 by 31 meters under construction in Silang. Plans for these markets are all Bureau standards.

The Indang Farm School building, 14 by 30 meters, is under reconstruction. It is a one-story building with adobe foundation, wooden walls and corrugated-iron roofing. It was built in 1907, but the adobe foundation and walls have all crumbled; joists, girts, and almost all the wood work have been eaten by anay.

Mendez Nuñez will soon have a water system. An allotment of ₱25,000 has already been set aside, but it is doubtful whether it can be completed in two years as the materials will have to come from the United States.

The municipality of Cavite is planning to put concrete market tables in its 30 by 43.50 market.

CEBU.—All the piles for the Cebu Wharf extension have been driven and there remains only 7 more slabs and 9 more piers to be poured to complete work embraced by the present appropriation. An additional appropriation of ₱119,100.27 has recently been received to continue the work on the Cebu Wharf. Work will be resumed as soon as the dredge arrives from Manila.

Dredging will be started immediately to reclaim the area between the present shore line and the new wharf. This work, when completed, will add a large track of valuable land to the city's water front.

Plans are now being prepared for a wooden dock to be used instead of a concrete dock such as was used on the Tacloban Wharf.

The first-class road system was very badly damaged by the unusually heavy rains during the first quarter of 1918. About 25 kilometers of the second-class road between Asturias and Tuburan has been practically destroyed.

During the second quarter of 1918 a very great improvement has been made in the first-class road system. The Cebu–South from Moalbual (km-88) to Cebu is now in excellent condition for its entire length. The Cebu–North from kilometer 106 to Cebu, which was in very bad shape last February, is now in fairly good shape with the exception of a few short stretches from kilometer 80 to 86. There are, however, a number of sections, which while appearing to be satisfactory at the present, are actually rather weak and will undoubtedly fail during the coming rainy season unless extensively patched or resurfaced. The Cebu–Toledo Road, while being rapidly improved, still has a number of sections in poor condition. Work is being rushed on this road as rapidly as possible.

In order to bring these roads back to their former condition it was necessary to spend a large amount of money, as work in some cases was pushed both day and night. There had been spent, in round numbers, ₱174,400 for maintenance and reconstruction work from January to June. This has made it necessary to request approval for an overdraft of ₱80,000.

The new crude-oil engine recently installed at the Danao Quarry, while cheaper to operate than the old coal burning plant, does not turn out as much stone by 30 per cent as the latter. As there seems to be plenty of reserve power it is believed that by putting on a larger pulley the plant's capacity will be made the same as before.

Work on markets and schools has been greatly retarded owing to the lack of lumber, as the local companies have not the transportation facilities to bring the lumber from their mills to Cebu. At present work on one No. 20 school and four markets is being delayed on account of lumber shortage.

Work has just been started on the bridge at Calle Colon, municipality of Cebu. Work will consist of moving the old 80-foot steel span from its present position to the northern half of the channel and placing it on new concrete piers supported on timber piles. The remaining space will be bridged for the present by a timber deck on timber pile bents. Later, when more money becomes available, these will be replaced by the standard concrete deck girder bridge on concrete pile bents.

Owing to the fact that only 8 rollers are available comparatively small progress has been made so far in new road construction, as all the rollers except one are needed on the resurfacing work. One kilometer of the Argao–Dalaguete Road has been completed, 3 kilometers of subgrade of the Lago–Taboilan Road has been placed but not rolled, and about 6 kilometers of subgrade has also been placed between Moalbual and Badian. Both of these roads could have been surfaced by this time except for the necessity of waiting for a roller to roll the subgrade.

Other roads under construction are Barili–South, Aloguinsan–North, San Francisco–Paro, Guadalupe–Mabolo, Bantayan–Madridejos, and Opon–Cordova.

Bids for the Sibonga, San Fernando and Danao Markets were all rejected. Materials for all have been requisitioned and most of it is now on hand. The construction of these markets will be started as soon as conditions permit.

All bids for the Liloan Market were rejected. The materials for this market were received and the labor is funished by Mr. Deogracias, the only bidder, for ₱2,300. The work is now proceeding at a satisfactory rate.

Work has been started on a Standard Plan No. 20 school at Carcar by administration and the concrete work is nearly completed.

About ₱15,000 is being spent for general repairs and improvements to the Southern Islands hospital buildings.

The second-class road system, which also sufferred severely during the last rainy season, is also being brought back to shape although the work is somewhat handicapped by lack of an available roller and because such a large percentage of the road and bridge funds have been devoted to the first-class roads.

Following allotments have been received: ₱50,000 for the construction Cebu–South Road and bridges, ₱20,000 for the Dumanjug water system, ₱25,000 for additional work on the Carcar water supply system ₱14,000 each for water systems at Malabuyoc and Ginatilan, and ₱6,000 each for water systems at Poro and Tudela.

COTABATO.—No project notes received.

DAVAO.—Very little active construction work was accomplished in this province during the first quarter of 1918 owing to shortage of labor and the smallpox epidemic which spread over the entire province. The Bureau of Health has vaccinated practically all persons in the province and the quarantine has been removed and active work has been started on the important projects.

The Davao Santa Ana Road has been resurfaced with river gravel and on account of the heavy traffic (40 automobiles and 5 trucks for 4 kilometers of road) it is necessary to keep 10 bull carts and 20 laborers working all the time to keep this road in passable condition. The province has requisitioned a 1½-ton truck to take the place of carabao carts.

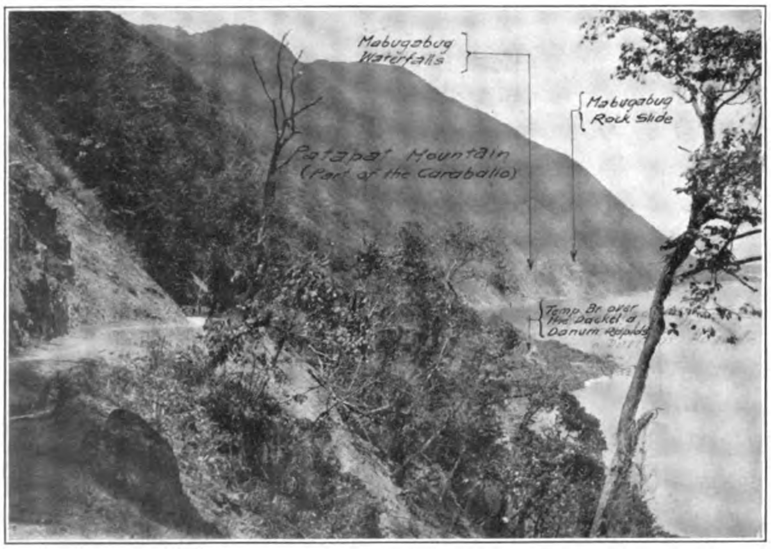
Twenty miles of new telephone line has been constructed on the Davao North Line starting from Cuabo Wireless Station. The large plantations on the east coast of the gulf having furnished the labor for cutting out the trail and the province furnishing materials and men to string wire and install telephones.

Reconstruction work has been started on the Davao Dock for which ₱30,000 is available.

NOTICE
THIS DOCK IS NOT SAFE FOR OVER 100 KILOS PER SQUARE METER
ESTE PANTALAN SOLO PUEDE SOPORTAR UN PESO QUE NO EXCEDA 100K CADA METRO CUADRADO

Temporary Dock at Davao, Davao.

ILOCOS NORTE.—With the recent completion of the San Nicolas–Dingras Road, 8.7 kilometers of new road have been declared first class. The town of Dingras, the granary of Ilocos Norte, has been made accessible at all times, except during typhoons. This road, 18.7 kilometers long, is now the best road section in this province, and will probably be one of the serious contestants in the next road competition. Its total cost in round figures amounts to ₱137,600.

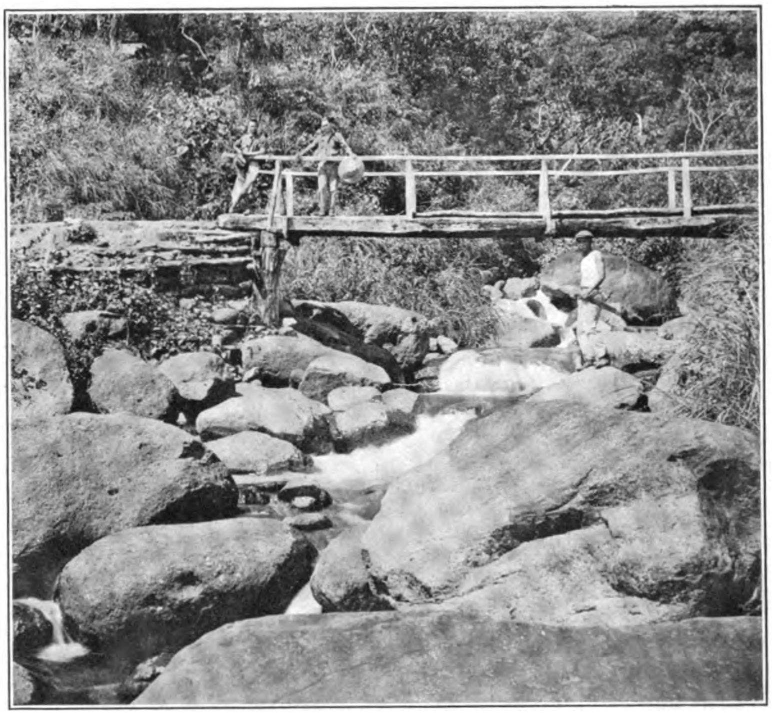

Mabugabug Waterfalls
Mabugabug Rock Slide
Patapat Mountain (Part of the Caraballo)
Temp. Br. over the Daokel a Danum Rapids

Patapat Mountain (part of the Caraballo), Ilocos Norte.

The horse trail between Camp Banua and Pasaleng Hacienda, 7 kilometers long, the most difficult section of the proposed Bangui–Claveria Trail, was completed at the end of February, 1918. The finished section is probably one of the most picturesque and sensational trail sections in the Islands.

Work on the Bangui–Claveria Trail is progressing quite rapidly. There are at present 22 kilometers of permanent and 7 kilometers of temporary horse trail built by this province, the permanent one being under caminero-gang maintenance. Very few laborers remained to continue the work due to the rice-planting season; however, it is expected that the temporary horse trail will soon be made permanent when this period is over and more laborers become available.

The town of Claveria, Cagayan, can now be reached on horseback from Bangui. The trip from Bangui to Claveria may be made as follows: From Bangui follow the old cart road up to the Barrio to Subec, about 9 kilometers distance; thence over the forest hills on a 16-kilometer horse trail to Camp Banua, 4 kilometers of which were temporarily constructed to make the work easy access for laborers and supplies. The trip from Camp Banua, which is located on the seashore, up to the Macagutigut (suggestive) Gap is the most sensational on the entire Bangui–Claveria Trail. This trail section is approximately 12 kilometers long and follows, for a distance of 5 kilometers, the steep and rocky hillsides of the Patapat Mountains (part of the Caraballo Mountains) and then drops down to and crosses the Pasaleng Valley, nearly 2 kilometers wide, to again ascend the wooded hillsides of the Caraballo Mountains up to the Macagutigut Gap, 910 feet above sea level. From this place down to the township of Langangan, Mountain Province, a temporary horse trail, 3 kilometers long, was built for the same purpose as at Subec and also to open up the trail for traffic clear up to Claveria. From



Temporary Bridge over the Daokel-a-Danum Rapids at Patapat Mountain Bangui-Claveria Trail, Ilocos Norte.

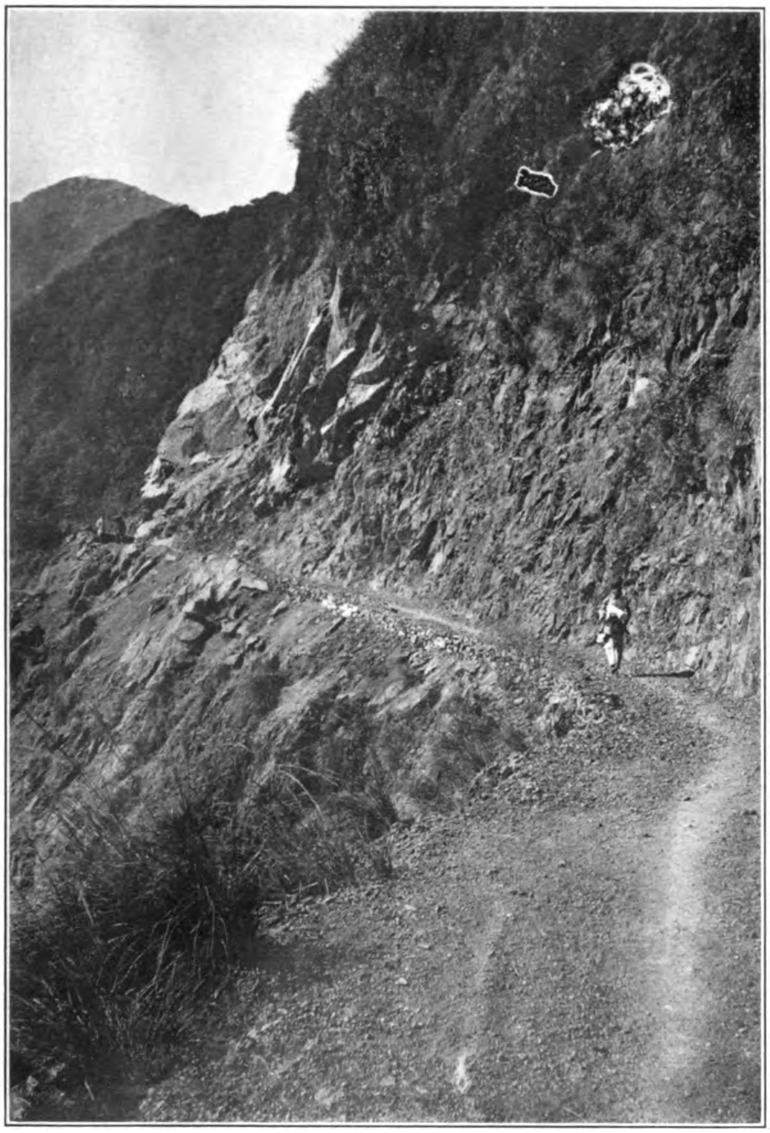
Mabugabug Waterfalls at Patapat Mountain, Bangui-Claveria Trail, Ilocos Norte.

this point to the end of the journey, the old horse trail may be followed up to the barrio of Quilquiling for a distance of 15 kilometers and from this last barrio to the town of Claveria over the finished subgrade, 5 kilometers long, for a first-class road, constructed by the Province of Cagayan during the last twelve months.

The total length of designated first-cass roads in this province as of July 1, 1918, is 78.2 kilometers, representing an increase of 8.7 kilometers of new first-class roads over those existing on January 1, 1918.

More than 1,200 fruit trees have been planted along the first-class roads and others will be planted in the near future.

The Lawag–Sarrat Road is being entirely surfaced. The heavy cart traffic on this road caused considerable wear to its surface and made the road so dusty that its resurfacing was deemed necessary.



Mabugabug-Rock slide, forty meters west of the waterfalls, Ilocos Norte.

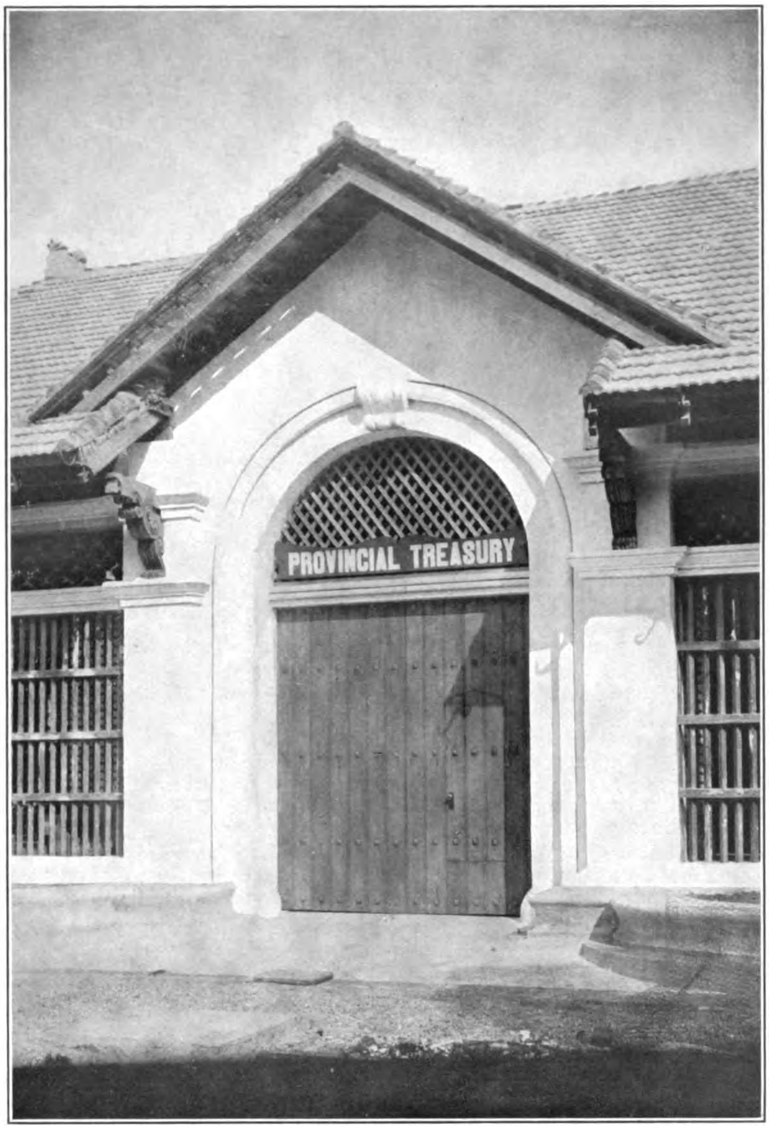
Work on the protection of the north abutment of the Gilbert Bridge at Lawag has recently been started. It is proposed to deviate the current toward the center of the river by means of a wing dam.

Four wooden pile bent bridges with a total length of 29.07 lineal meters have been entirely reconstructed on the Lawag–North Road, the old ones having been very badly damaged by anay. The construction of a new wooden pile bent bridge, 18 meters long, over the Madupayas River, on the Dingras–Piddig Road, will soon be completed and the travel over this road will thus be made easier, even during heavy rains.

The construction of the Lawag Provincial Building is progressing somewhat slowly due to lack of funds and difficult boat transportation.

The Northeastern Provincial Building annex was completed on the first half of June and is being occupied temporarily by the provincial treasury. The pleasing appearance of this building and its good ventilation and lighting have been commented on very favorably by every person who has visited it.

The construction of the Paoay school has been suspended owing to shortage of funds. Work on this project will be resumed as soon as the ₱10,000 loan applied for by the municipality of Paoay is granted.



Main Door of the Laoag Provincial Building Annex. Ornaments uncompleted.

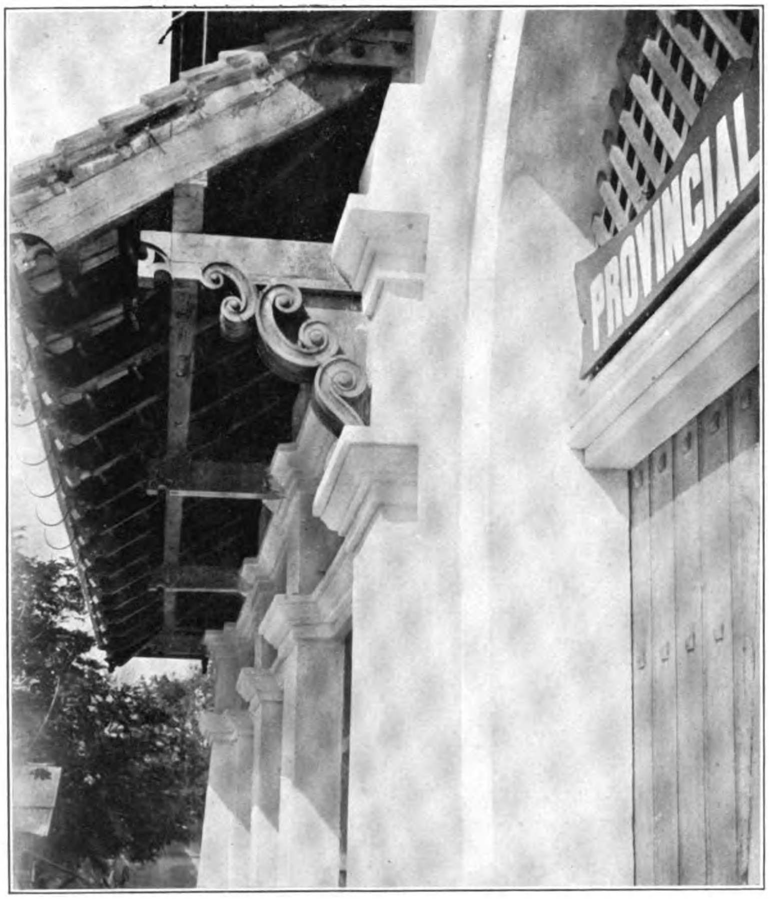
Part of the Bangui school building is now occupied by the school; the rest will be finished when enough donated lumber is furnished.

One artesian well was successfully drilled in the town of San Nicolas. Due to lack of water pressure, a deep well pump had to be installed. The artesian well-drilling machine is now working on the second well at Lawag, the first one being unsuccessful.

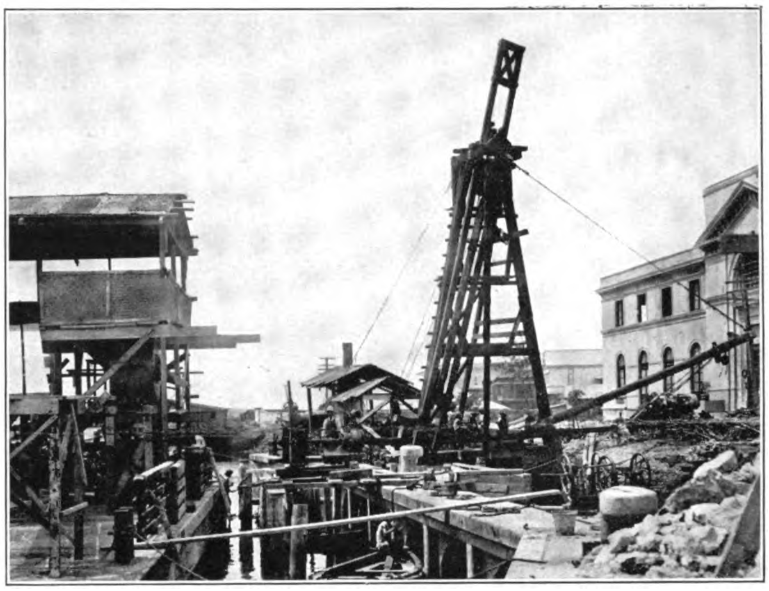
During the past quarter three artesian wells were successfully drilled in Lawag. An artesian well-drilling machine is now working in the municipality of Sarrat.

Work on the 1918 repairs to the Lawag Constabulary Barracks will begin soon, ₱700 having been appropriated for this purpose by the Insular Government.

The construction of the proposed Northern Luzon Normal School at Lawag will commence in the near future. It is understood that plans have been submitted to the Consulting Architect for approval.



Carved wood bracket and rafters, Laoag Provincial Building Annex.



Iloilo sea-wall construction equipment.

ILOCOS SUR.—All first-class roads in this province are in excellent condition. In proof thereof the inspection committee which graded the roads of the Islands during December, 1917, and January, 1918, for the purpose of distributing the "Michelin Road Maintenance Prizes" gave highest award to the maintenance forces of this province. There are at present 138.1 kilometers of first-class roads in this province.

The Bantay–San Vicente–Santa Catalina–Bayubay Road was completed on June 30. This road is an important one as it connects three municipalities with the main coastal road running north and south through the province.

On the Candon–Sevilla Road a four 7-meter span reinforced concrete pile bent bridge has been completed, and two more put under construction, one 7-meter, and one of two 7-meter spans, also one double 5 by 2 meters rectangular box culvert.

A large number of old Spanish culverts have been repaired by putting new footings, wing walls, and new arches in same.

Investigation and survey is being made on a road which leaves Candon going east and passes through the large township of Galimuyod, and will connect up with the newly proposed municipality of Salcedo.

The construction of the Santa Catalina school building has been stopped on account of the budget not being approved, also for the lack of materials, same having been ordered from Manila.

An additional ₱3,000 has been made available for the continuation of the work on the Bantay Presidencia; materials have been ordered and partially received and work has been put underway.

ILOILO.—The maintenance of first-class roads progressed very nicely until the last few days of the quarter when a number of the temporary or collapsable bridges were removed by high water. As a result, a number of towns are at present cut off and will be so, until the water subsides and the bridges can be replaced.

An additional length of 8.3 kilometers of first-class road was added to the system of this province by the declaration of June 30, 1918.

On the Iloilo–Antique interprovincial road the subgrade is nearing completion in the section San Joaquin–Tiolas, and about 3 kilometers of gravel has been placed. Three kilometers of grading and 2 kilometers of gravel have been completed west of Tiolas.

On the Zarraga–Barotac Nuevo Road, about 5 kilometers of the subgrade has been completed to the intersection with the road Lucena–Jalaud.

The Barotac Nuevo–North Road has been completed as far as Tinorian. Surveys have just been completed as far as Banate.

The Pototan–Dueñas Road is practically completed except the temporary bridge near Dueñas. When this bridge is placed autos can pass Iloilo to Passi via Calinog.

Work has started on the Janiuay–Lambunao Road; about 1 kilometer graded and contract let for placing gravel. This road is about 20 kilometers long, but only ₱20,000 has been appropriated.

On account of the high cost of construction materials the provincial board has decided to use the funds reserved for a high school to construct a temporary building. This building will be of mixed materials of the Plan No. 10 type. It is estimated to cost 8,000 pesos and to last 5 to 6 years.

Funds being exhausted, and the dredge being needed elsewhere, dredging in the Iloilo River has been stopped. This is very much to the displeasure of the residents of Iloilo, but there is no other recourse.

The Iloilo River wall has progressed rapidly and satisfactorily for the past month. This wall is being built in 20-foot sections. The third section has been completed and the forms are being set for the fourth. The first section was very slow, on account of the great amount of preliminary work getting the plant together and old wall removed. The first section was about four months under construction, the second 65 days, the third 35 days, and it is hoped the fourth will not take over 30 days, and this should still further be reduced. This wall is of 19.6 square meters cross section, bottom of concrete 6 meters below mean low water, the top 2.29, with 20 piles per section, 16 of which are on a 1 to 3 batter and 4 in the rear vertical. The completed cost of section No. 3 was ₱801.25 per lineal meter, or just a little over ₱40 per cubic meter for the concrete in place, including piling and reinforcement. This figures ₱244.30 per lineal foot, which is considerably less than the lowest bid received and is considered quite reasonable with the high cost of cement.

ISABELA.—About 2 kilometers of subgrading are completed on the Ilagan–North Boundary Road. As this part of the province is exclusively a tobacco country, and owing to the extraordinary high price of tobacco at present, there is not a single bull cart working on the construction. This difficulty will be solved however as soon as the Government truck arrives as it will be used for hauling gravel.

Construction on the provincial building enlargement is progressing rapidly. It is expected to finish the structure by August.

Naguilian Presidencia is in process of construction; half of the labor is being done by the people free.

Work on the construction of Angadanan–Cauayan Road is progressing rapidly. By July first there will be left 5½ kilometers yet to be constructed. It is expected to finish them before the end of the fiscal year. One of the chief factors which has accelerated the progress of the work on this project, is the plan adapted by this office to sell rice to laborers at the same price which it costs the Government, which has made them stick to the job.

A plan is under way for making all the river crossings passable during the rainy season with the least possible danger.

The maximum velocity of rivers during rainy season is about 4.6 miles per second. On account of lack of bamboo suitable for making ferries, hermetically sealed banquillas are now being made. Five such banquillas in one ferry can easily carry a three and one half ton truck without the least danger of being sunk.

LAGUNA.—Fifty thousand pesos have been alloted to the construction of a new road from Pagsanjan to Luisiana. This road will pass very close to Cavinti which will profit by the new project. It is ultimately proposed to make this road an interprovincial highway opening up communication between the towns of Tayabas Province and Laguna Province. It is interesting to note that the people of Cavinti are already improving certain sections of this road by voluntary labor.

The road section between Nagcarlan and Lilio should be entirely surfaced and rolled by June 30. The Lilio reinforced concrete slab bridge and girder has been completed. The truss bridge near Nagcarlan will not be completed until August, owing to unusually long delay in the delivery of bridge timber.

One new abutment for this bridge is now completed. This is a very large, mass concrete, structure. The excavation presented difficulties due to the water which filled the hole after the work passed below the surface of the river which flowed close by. Pumping was necessary but no adequate pumps were to be had. It happened that the river has a steep fall at this point, so it occurred to the district engineer to try a siphon. Two hundred feet of 6-inch drive pipe used in artesian well construction were obtained and installed. The upper end required a bend, and as no elbows of this diameter could be found in Manila, a bend was achieved in one of the big pipe sections with the aid of a fire, a road roller jacscrew, and two large boulders conveniently at hand.

When the entire pipe line was connected up and in place, the uppermost bent joint was rotated until water could be poured into the end. The lower end of the line was stopped up with a wood plug. The line was then filled with water and the top end lowered into the water of the excavation. The plug at the lower end was then pulled out, and the column of water in the pipe as it flowed out had no trouble in sucking up the water in the excavation. The outwatering was, if anything, too rapid, and, at first, time was lost when the siphon sucked air and emptied itself of water, thereby requiring a refill by hand.

A gate valve on both ends would have been very useful, but one could not be found in Manila. Smaller diameter pipe, say 3-inch would have been easier to handle and two lines of this size would have given better results than the 6-inch pipe used. Whereas it took twelve men working 18 hours in shifts to outwater the excavation by bunkets, and not very successfully at that; the siphon did the job in one hour and fifteen minutes.

In order to prevent the siphon from emptying itself, a half plug was inserted in the lower end to decrease the discharge. The proper size of the hole at the exit was found by experiment. This hole, of course, was placed at the bottom of the pipe cross section.

Two additional rooms are being added to the Cabuyao schoolhouse.

Materials have been ordered for the finishing touches to the Alaminos schoolhouse, and, also, to the Lumban schoolhouse. Two additional rooms are to be added to the Nagcarlan schoolhouse when the materials arrive. A domestic-science building for Calamba will soon be begun as, also, a septic tank for the Calamba schoolhouse and another for the San Pablo schoolhouse. The ceiling of the Lilio schoolhouse was completed during the second quarter. Two extra rooms are to be added to the present schoolhouse at Cabuyao. The school authorities are now agitating preparations for the next meet of the Southern Tagalog Athletic Association to be held at Santa Cruz next December.

The Calamba market was completed and turned over to the municipal authorities.

First-class road construction will be begun on the old Santa Cruz–Pila Road as soon as the regular allotment of ₱25,907 is released.

The Pagsanjan waterworks system became a live project and the materials were requisitioned during the second quarter of the current year. This job is estimated to cost ₱60,000.

In Santa Cruz a modern flush closet and septic tank is under way; also a new telephone central building and a garage for provincial cars.

Six thousand pesos each for repairs to the Dapa and Paudlet Dams were released in June.

Materials are being assembled for the construction of a new reinforced concrete arch bridge over the Molawin River near kilometer 69 on the Manila–South Road to replace an old Spanish adobe structure.

Plans are being prepared for a new bridge across the Magampon River on the San Pablo–Alaminos Road.

The streets of San Pablo and Alaminos will soon be repaired.

A modern garbage crematory is expected to be completed before the close of the third quarter for the progressive city of San Pablo.

Improvements are under way along the provincial road from Lumban to Santa Maria, most of it being under the personal supervision of the provincial governor, Hon. Juan Cailles, who has secured the assistance of fifty Bilibid prisoners for this work.

The railroad service for the delivery of rock from the Los Baños quarry has not been all that could be desired, but this condition has improved and by the end of March, 1918, was operating fairly well.

LANAO.—Road maintenance has been greatly hampered owing to the nondelivery of dynamite, as practically no rock can be quarried without explosives. Weather conditions have not been entirely unusual, though there were three local rains amounting almost to cloud bursts. That of April 4 affected the Overton–Keithley Road from kilometer 6 to kilometer 12 on the Agus Bluff. Almost all the metalling was washed off the Telford on kilometers 6 and 7, where the damage is estimated at about ₱3,000. This same rain caused a flood of Iligan River which resulted in the sinking of part of the rock fill under Iligan ford south approach. Though the shell remained intact, the upstream curtain wall failed, which has necessitated opening the ford and refilling and underpinning with piling and a concrete capped pier to obviate further damage, which work is now in progress. The damage to the ford including additional necessary work is estimated at about ₱2,000. On June 13, another heavy rain resulted in further damage to the same road on kilometers 28, 29, and 30.

The storm of June 27 and 28 affected only the southeast coast of the Lake District, causing numerous slides on the Tamparan–Kalawaig Trail; washing away and putting entirely out of commission about 2 kilometers of the trail bordering on the lake; and resulting in a rise of the lake to 1.02 meter above normal.

The Overton Bridge has been reconstructed and roofed over with old galvanized iron. It has been opened to traffic about two months. This is a wooden pile bridge with a deck approach truss, which had to be placed owing to the hard bottom not taking piles, due to a projecting coral shell from the west side of Nonucan River.

The work on the Iligan–Misamis Boundary Road is progressing nicely considering the small gang of laborers engaged. Metalling was begun in the latter part of May and in June advice was received from the department governor that only the subgrade should be built this year. It is however very doubtful that this change in plans will speed the construction, as the small amount of available transportation for hauling rock probably will not be increased for next year while if employed this year only a very few laborers would need be diverted from the subgrade work, as 3 kilometers of the old subgrade only needs widening and ditching, and the rate of metalling about 600 meters per month could be maintained without any delay to the subgrade building.

The location of the Dansalan–Ramain–Masiu Trail has been made to the Ramain River, and with the exception of about a kilometer, which passes rather, low ground, the location is over good ground, though the first 4 kilometers are somewhat hilly. Work has begun and a fair amount of labor is available.

Piles are being delivered for the new Overton Wharf, for which there has been appropriated the sum of ₱30,000. The proposed location is about 1,200 meters east of the present wharf, in a small cove having deep water close in shore.

LA UNION.—The opening of the subgrade of the 8-kilometer Agoo–Tubao Road this year has facilitated the transportation of the tobacco products raised in the terminal town of Tubao, which is essentially a tobacco producing municipality. In 1917 alone the value of the crop sold here amounted to over a hundred thousand pesos, and never in previous years has a more extensive area been put under cultivation than in 1918, when the people knew they can adequately transport their products on a new provincial road to the railroad station at Agoo. Formerly the only way for cart hauling was the 3-kilometer old broken road from the town of Tubao to the Agoo River, with grades as steep as 25 per cent, and the portion of the stony bed of the above river between Tubao and Agoo. The first portion becomes very muddy during rainy season, specially in May, June, July, and August, the time for transporting tobacco to the market, and in those places where the road passed over hills (probably for the sake of better alignment) with the resulting steep grades, the tractive power of the carabao or bull is materially lessened. The bed of Agoo river is very rough and stony and increases the cost of hauling by as much as 25 per cent over that of good roads. Although the new provincial road is yet unsurfaced, it is and will be passable during the rainy season as in many places in its location the strata encountered consist of gravel, and a small gang is kept on this road to remove slides, fill washouts, and maintain it in passable condition.

The surfacing of the 34-kilometer Camp One–Aringay Road is going on steadily. About 5 kilometers of first course and half a kilometer of second course surfacing has been rolled in place and the placing of the third course has recently been started. Part of this work is being done by contract and part by administration. The difficulty of securing bull carts in this province at present prevents the rapid completion of this job. The quarantine of work animals here due to presence of rinderpest, and the good crops produced this year both combine to render the situation less favorable for the early transportation of gravel. The earning capacity of one bull cart hauling tobacco for the Tabacalera may be estimated fairly at ₱3 per day, double the conventional amount paid by this district. Aside from these difficulties, comes the rice planting and consequent reduction in our working force. However, it is expected that in the next month or so, this abnormal labor demand will subside and there will be no difficulty in securing men and materials for public works.

The subgrade of the provincial road connecting the town of Santo Tomas with the Camp One–Aringay Road has just been completed. The new diversion will enable traffic to intercept the Manila North Road at a distance of 700 meters, instead of going along the old route to Agoo 5 kilometers away to join the same. That section of this diversion included between the Camp One–Aringay Road and the railroad line, about 300 meters long, is of standard width of 15 meters, and that section from the railroad line to the plaza is an old municipal road which had just been graded and repaired.

The remaining 40 lineal meters of the west approach of the Luna spillway has been completed, all the side slopes of the road have been filled or cut in shape and sodded, and the entire section was opened to traffic early in May.

The construction by administration of the Luna Market, built on Standard Plan 15 by 31 meters, was begun in the later part of April. Owing to the delay in receiving the steel requisitioned from the Bureau of Supply, the construction was suspended for sometime. It is now nearing completion.

The construction of the Luna Central Barrio School, a timber structure modelled after standard Plan No. 7, Bureau of Education, was commenced in the middle of May by administration. Anticipating the early arrival of ipil posts ordered sometime ago, this office proceeded to prepare the roofing frames and other parts of the building, so that on receipt of the above materials, the construction of the building will go on with the least possible delay.

The construction of Santo Tomas bath houses has been recently started. This is a municipal project for which ₱1,000 has been appropriated. This building is to be 4 by 5 meters with six rooms, to be provided with bath showers. The water is to be pumped from the flowing artesian well in the town to a storage distributing tank. The water here has been known in Ilocano provinces to have a medicinal effect and many people, specially during the dry season, come in quest of this fountain. The municipality constructed in the past several cogon shacks as bath houses, which proved inadequate to supply the need of the better class of travelers.

Tree planting along the road side was started in the early part of June of this year. Along the San Fernando–Bauang Road mango trees are planted on both sides; along San Fernando–San Juan, santol; and along San Juan–Bacnotan, mabolo. Between each town only one kind of tree is planted to gain aesthetic effect.

LEYTE.—The construction of the provincial building is progressing satisfactorily in spite of adverse conditions. All concrete work up to the first floor is completed. Forms for the fancy work along the edge of the finished grade are in place and also the forms for the girders for the concrete floor. Because of poor gravel available it has been decided to employ crushed rock from the Utap quarry for concrete aggregate for girders, beams and floor slabs. The fancy ornamental work made in Manila has been received. It is cast with rock from the Nipa Nipa quarry at Samar which is crushed at Tacloban and shipped to Manila.

The following cost data of Nipa Nipa rock may be interesting:

	Per cu. m.
Cost of rock at quarry, Nipa Nipa, Samar	₱2.68
Transporting by scows (20 kilometers)	6.50
Hauling from beach to crusher (½ kilometer)	.40
Cost of rock placed at crusher	9.58
Cost of crushed rock	15.58
Hauling cost 104 barrels of rock	10.40
Total cost of 104 barrels of crushed rock O. B. ship Tacloban	245.14

Because of abnormal conditions the materials for the following building projects have not all been received so that nothing has been done on them at the present writing: Palo Presidencia, Dulag and Burauen markets.

The Trade School Academic Building, a No. 7 standard plan, is completed. Four doors have been constructed at the back part of the building preparatory to the construction of additional back wings when conditions so require.

The cost of the building was as follows:

Miscellaneous	₱366.27
Labor	4,006.36
Materials	13,511.24
Surcharges	2,004.50
Total cost	19,888.37

Gravel is now being prepared along the Burauen–Dulag section of the Palo–South Road. This is the worst section of the first-class roads in Leyte to date but is still passable during dry weather. To prevent further damage the gate system has recently been placed on this section.

The inauguration of the Tanauan–Tolosa Road was held on May 30. An automobile parade was held from Tanauan to Telegrafo, a barrio beyond Tolosa; speeches were made before and after the banquet, which was followed by a dance in the evening. An appropriation of ₱5,000 made possible the construction of temporary timber bridges over the Embarcadero and Limbuhan rivers and several small culverts. The old Spanish road was improved in some places and voluntary labor did the cleaning in others. It is the intention to open up the road to Dulag by constructing all temporary bridges and improving bad places along the road. Credit is due to Governor Demeterio who was very instrumental in encouraging the barrio people to furnish the necessary coconut logs free, delivered at the bridge sites, and to do the minor work of cleaning up the road of cogon grass and small shrubs.

The following roads are now under construction by contract; Maasin-Matalom Road, Baybay–Abuyog Road, and Villaba–Palompon Road.

The sum of ₱64,220.18 has been made available for the filling in behind the new wharf in Tacloban. It is expected that an hydraulic dredge will be sent to Tacloban to do the work.

Preparatory to the surfacing of the new wharf, about 400 tons of bituminous limestone have been ordered from the Leyte Asphalt Company. This material is being mined near Villaba, where there is an immense natural deposit. Mr. Wm. Anderson, who at one time was working for the Bureau, is at the head of this company.

The construction of the telephone line between the towns of Hinunangan and Hinundayan is completed and the connection between Hinundayan and Cabalian will be completed this month. For the first time these towns are connected with a communication medium. The towns of Libagon and Sogod will also be connected with the telegraph station at Malitbog, making these towns in direct communication with Tacloban.

The repairs to the Tacloban–Carigara Road are being pushed as rapidly as possible under adverse conditions. Labor is scarce and rinderpest took away a number of work animals. The cost of hauling has increased from ₱0.40 to ₱0.50 per cubic meter per kilometer. Due to the rise in the price of gasoline, the Leyte Land Transportation Company has also demanded an increase of from ₱0.60 to ₱0.80 per cubic meter per kilometer. A compromise, however, has been agreed upon on trial basis, that is ₱0.70 per cubic meter per kilometer.

Two new quarries have been recently opened. One at Utap at kilometer 3 on the Tacloban–Carigara Road and the other at Malirong at kilometer 14 on the same road. Bids for the operations of these quaries were asked for and a number of propositions were received. Due to lack of reliable data on unit cost in the first quarry, it was decided to run same by administration and the bids were rejected. The Malirong Quarry is being worked by a contractor at the following prices:

	Per cu. m.
First course (6-inch rock)	₱3.50
Second course (2½-inch rock)	3.65
Screenings	0.25

MINDORO.—Work is progressing satisfactorily on the Pinamalayan–Jolo Road, the grading of which has been completed to Makanlig River, a distance of 7 kilometers from the coast. The clearing has advanced a kilometer beyond said river. Up to kilometer 7, no materials for surfacing could be found, but when kilometer 8 is reached gravel can be secured from the Pula river.

Surfacing on the Calapan–Jolo Road is going on without any interruption. The work is now on kilometer 6.3 and broken rock from Liang quarry is still being used which costs ₱3.20 per cubic meter delivered at the point of construction. The road roller has been used to pull several bull carts loaded with broken stone in order to meet the demand for the supply of crushed rock and to minimize the cost of transportation of materials.

Work on grading is being pushed on the Calapan–Baco Road. In spite of the scarcity of local labor, carabaos are being employed to a large extent in plowing the ground and pulling the drag scrappers, which has proven to be very economical. There have been encountered some difficulties in obtaining the road right of way in the relocation of this road. The agreement arrived at between the local landowners and this office, in this connection, has been that the latter will pay only the improvements cut down from the proposed road and the land be given gratis to the Government.

No bids were received for the Abra de Ilog School building and the construction is now being under taken by administration. The school is a semipermanent, Plan No. 2, Bureau of Education type. The Silonay barrio school, Plan No. 1, Bureau of Education, semipermanent type also, is likewise under construction by administration. It is expected that the school will be completed by the end of July. The materials for the Agcauayan, Lubang, School, have been received but on account of the shortage in the funds available, the construction cannot be begun. However, a communication from the division superintendent of schools has been received informing this office of the coming of additional funds for the project.

The Calapan Waterworks system was completed and turned over to the province on February 28.

The installation of pipes into houses is still in progress, as applications for same are being filed and approved.

The construction of the extension of the Calapan Water System to the dock is nearing completion. The work on excavation and refilling of trenches has been given to local laborers at the rate of 4 centavos per lineal meter. It is expeted that the project will be completed with the total expenditure of ₱6,400.

The construction of the addition to the provincial storeroom at dock has been completed and turned over to the provincial treasurer in the early part of this year.

The maintenance of the second and third class roads is one of the principal projects in this province.

The passing of heavy loaded bull carts, especially during heavy rains makes the roads practically impassable. This is especially true of the Calapan–Naujan and the Naujan–Pola sections. With the small funds available for the maintenance of these roads great effort is being made to spend the money economically as well as to keep the roads in good condition.

MISAMIS.—Due to the heavy rains of December and January last, the first-class roads of Misamis Province were damaged to such an extent that it became necessary to reconstruct the greater part of all the first-class roads as well as the second-class roads in the province, therefore, very little or no first-class roads will be constructed this year with the exception of the Misamis–Bukidnon Road.

An appropriation of ₱30,000 was made by the province in addition to the regular maintenance appropriation for the resurfacing of the section from Cagayan to Tagoloan. Nearly 4,000 cubic meters of stone and gravel have already been placed, working eighteen hours a day.

The roads in the Camiguin section were damaged more during the heavy rains owing to the large amount of automobile traffic. Insular aid to the amount of ₱30,000 was secured and the work of surfacing, regrading and the placing of additional culverts is being rushed in order to complete as much as possible before the heavy rains come on. A little over ₱14,000 of the above allotment has been expended.

A very small amount of resurfacing on the Misamis–Oroquieta section has been done as the price asked by the people for transportation is prohibitive and this office is patiently waiting for the Ford trucks ordered last January to do this work.

Very little work has been done on the maintenance of second-class roads in this province owing to the shortage of labor. The same conditions exist with project No. 3, maintenance of third-class roads. However, this project will receive more attention in a short time.

Great efforts are being done to get the road open for traffic from Misamis to Oroquieta, but it has been up-hill work, three steps forward and one back. A heavy flood took out nearly all of the provisional bridges and culverts, which are being replaced with larger spans, so it is hoped that that particular backward step will not happen again. There remain several stretches of fill to be made and replaced which is being done with very indifferent Moros on the "Paquiao" plan, so it is hard to predict just when the road will be opened. Labor in this section is exceptionally scarce.

By July the Cagayan–West Road will be opened for all traffic during the dry season as far as Alubijid. It is not planned to extend this work until the grade completed has been surfaced. The work of surfacing has been held up owing to roller troubles which have been overcome and the work at present is progressing quite satisfactorily.

An insular allotment of ₱40,000 was made for the reconstruction of the Tinao–Bukidnon Road, and it was started May 12 with a gang of 250 men, and, as is to be expected with this number of men, the work is going very rapidly and the only regrettable thing is that the allotment was not large enough to allow us to continue the balance of the year on "high."

A large temporary building 12 by 29 meters has just been completed on the provincial grounds back of the provincial building which has two large storerooms, four departments for automobiles, one department 8 by 12 meters for a wheelwright shop, and another 5 by 12 meters for a machine shop. It is thought that the two shops will be a source of income from outside work, as the orders are coming in very fast; which may compel us in the near future to enlarge this project.

In Misamis province the price of labor has steadily increased during the past five years from ₱0.50 per day to ₱1 per day, and the quality has decreased almost in proportion, and the same conditions exist more or less through Mindanao and Sulu. No change for the better may be looked for in the future but to the contrary labor will continue to get scarcer and scarcer.

The district engineer has the opinion that the labor question throughout the Philippines has become the greatest problem that the district engineers have to deal with. These conditions are due to the high prices of products, and the people are able to make more in the fields, whether they are energetic or not, than when they work on the roads.

MOUTAIN PROVINCE.—Since about the beginning of the year, work on widening and grading of the Cervantes–Tagudin Road has been going on between Butac, kilometer 30.5, and kilometer 43, ommitting the zigzag of 4 kilometers long above Butac River, until a better line is located. A 60-foot Howe truss bridge has been completed at kilometer 126.5, Bontoc–Tagudin Road, replacing a triangular truss erected in 1913. The total expenditures were ₱1,482, divided as follows: Timber, ₱490; iron, ₱662; framing and erecting, ₱330. Iron pins were used in assembling built-up members and for angle block and lateral connections, in accordance with the latest details of the designing division. This is the first bridge of standard design to be constructed in this district and it will be interesting to note whether the use of sawn and seasoned timber will increase the life of the structure. The probable new location will cross the river about 0.6 kilometer above the present crossing, where there is a good site for a bridge. The span will be about as long as the bridge that the present crossing would require, but the site is very much better. A stretch of this road of 0.5 kilometer long, at kilometer 51, the highest part of this road, has already been finished, deviating a little from the old road to avoid a short switch back on heavy grade. It is planned to reduce the force of laborers working on this project during the rainy season so that money can be used to its full value. However, as rain seems to be more than plentiful this year, the cost of maintenance will be very much higher than what would be expended for same during the rainy season of a dryer year. Laborers on construction will be put only on rock work, as it will be useless to put them on dirt work during the wet season.

When additional money becomes available for the township presidencias, work on them will be continued, starting perhaps with the work on Bauko, Sabangan, and Tinglayan Presidencias.

Work on the building for Bontoc Electric Light Plan has already started. It will consist of one engine and generator room, one storeroom and one oil room. It is being built on the hill side behind the Government building.

A new trail, 73 kilometers in length, has been located from Lias on the Bontoc–Natonin trail, extending through the Madocayan and Guinubual Districts. The distance from Lias to Saliok, the junction of the Natonin trail is 10 kilometers shorter than by the way of Natonin, with a rise of only 80 meters, as against about 700 on the old trail. The section from Saliok east to Calao and west to Madocayan, 33 kilometers in all, will be completed this year. The remainder, connecting Madocayan with Lias is for future construction. This route will be of considerable importance as it will connect Bontoc with a large district and can be extended into Isabela.

Construction on the Emergency Hospital in Cervantes has been commenced. Work on other building projects consists so far in preparing materials, brick, lime, and lumber.

NUEVA ECIJA.—Owing to agricultural and commercial development in this province, laborers who are ordinarily available for road work have been given employment by private parties, and it has been impossible to get sufficient laborers to carry on construction work with any degree of progress. About all that has been accomplished in this province during the past quarter has been the maintaining of work which was previously completed, and there is nothing in the form of new work worthy of mention.

NUEVA VIZCAYA.—Over 2 kilometers on the Bagabag–Isabela Road have been reconstructed and surfaced during the month of April and May, making a total now of a little over 7 kilometers of metalled section from Isabela boundary. Eighteen kilometers of third-class mountain road to Magat River at Bagabag still remained to be reconstructed. The district engineer recommended to the provincial board 3-meter surfacing for the rest of this section in order to rush the opening of this road for motor traffic. After the completion of this section there will be about 79 kilometers of continuous first-class road from Bayombong to Echagüe and the transportation problem of Nueva Vizcaya products will then be solved.

Isabela lives on Nueva Vizcaya's rice and she is the market of the Nueva Vizcaya tobacco product. Isabela sells almost nothing to Nueva Vizcaya, so the whole benefit of the good road is practically for Nueva Vizcaya. The people of this province should therefore take more interest to help and coöperate in the construction of the remaining 18 kilometers from Bagabag to Diadi. The slow progress of the road work in this section is due to the difficulty of getting Christian laborers to go up there. We depend almost entirely on Ifugao laborers from the northern mountains of this province and Kiangan so the work at present is almost at a standstill because these people are harvesting and they will not be through till about the end of July.

Of the appropriation last year about ₱6,500 still remains available for this road. The district engineer believes that with ₱83,000 more, this section can be finished with the exception of big culverts and bridges.

To complete the reconstruction, and convert into first-class road the first 8 kilometers from Bayombong to Solano, the province received this year ₱12,000 Insular aid and ₱4,820 more of provincial road funds. The work on this section started last January and about 85 per cent is now finished. Gravel from the river was used for the surfacing of this road and was left to be compacted by traffic. When this section is finished, the province will have 20 kilometers of continuous first-class road from Bayombong to Bagabag.

The work on Morong Irrigation Canal was resumed last April and about 1½ kilometers of ditch has been completed, making now a total of about 2,000 lineal meters of finished excavation. The entire length of the ditch is about 6,300 meters. The original appropriation for this work was ₱14,605.10, and ₱2,040 was spent last year and ₱3,710 this year, leaving now a balance of about ₱8,855. The ditch has a trapezoidal cross-section with a 4-meter bottom width and side slope of 1:2. This ditch is supposed to irrigate a townsite of 780 hectares of reserved public rice lands and another several thousand hectares of public rice lands around it. The water will come from the Lanog River, southwest of the townsite.

In the last visit of the Secretary of Interior and the Director of Non-Christian Tribes arrangement was made that the Governor of the subprovince of Kiangan shall furnish the necessary labor for the construction of this irrigation ditch and to establish an Ifugao colony. In answer to this the governor of Kiangan sent down the first bunch of 60 Ifugao laborers, which was followed by a hundred more, but since the first of June all of them returned home to harvest and promised to come back about the end of July.

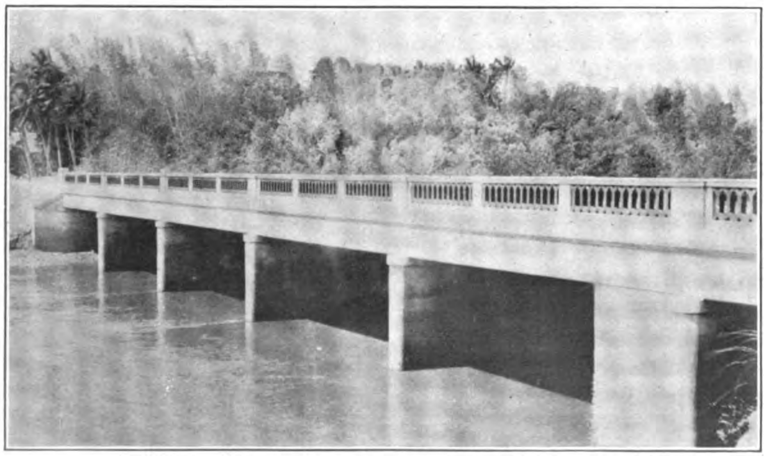
The Villaverde Trail (Bayombong–Pangasinan) has been excellently maintained. The road was reshaped, old narrow temporary bridges were renewed and the grass all along the road was cut. The places which used to get very muddy are being surfaced with a 2-meter wide and 12-centimer thick gravel in order to have the road from Bayombong to Imugan passable for carts all the year round. With the opening of the San Jose–Santa Fe Road for vehicle traffic, the Bayombong–Santa Fe section will need but little improvement for motor vehicle traffic.

For opening a horse trail to connect Kasibu Ilongotes Settlement School Farm with Campote, the province received ₱5,000 Insular aid. Eight and one-half kilometers are already finished and about 5 more kilometers remained unfinished. This trail goes over a range of high mountains, so zigzaging was unavoidable.

The construction of school buildings during this quarter was at a standstill due to lack of sufficient lumber and means of transportation and also because the provincial sawmill is being transfered to another place.

OCCIDENTAL NEGROS.—The Candaguit River bridge, a reinforced concrete structure consisting of three arches,—two 9-meter spans, and a 10-meter middle span,—has been completed in spite of all the difficulties during the period of its construction. It was finished under a contract of ₱19,980 with Mr. George Studier. To-day it stands as one of the toll bridges in the province.

It is expected that the reinforced concrete overflow bridge over Imbang River, Silay–Guimbalaon Road, can be finished by July 15, 1918. This bridge, having a length of 158 meters, is, perhaps, the longest of its type that has ever been constructed in the Philippines. It has a roadway 5 meters wide and has twelve lines of pipes, besides being provided with a gaging post to record the sudden rise and fall of the water. The banks of the river are subject to change, as has occurred during the past few years, and protection work would be necessary to guarantee the permanency of the structure. The construction of the whole is by administration and expenditure to date have reached a total of ₱29,744.83.


Sumag Bridge with red tile balustrade, Occidental Negros.

Materials for the substructure of the Binalbagan wooden truss bridge over the Binalbagan River, Hinigaran–Isabela Road, are being hauled to the site. The substructure of this bridge was completed about the middle of 1917, by R. Francis Adams, of Iloilo. The contract for the superstructure of the two 120-foot span, hard-wood, combination Howe trusses has been awarded to Mr. George Studier for ₱22,485 time 150 days. The work on this construction has been delayed very much on account of the difficult transportation of materials to the site and also on account of the heavy rain and floods in the river.

The construction of a block of eight double tiendas, 4 by 5 meters, on the Bacolod market site under Mr. Monico Puentevella's contract was begun two months ago. About 40 per cent of the whole work has been accomplished to date. Nearly all materials for this job are on the site so its completion can be expected very soon.

The Bago Market, the contract for which was awarded to Mr. Monico Puentebella, was begun early in June. At present about 30 per cent of the work has been accomplished. The building will be a wooden type 24 by 12 meters structure. Contract price ₱29,090, between the municipality of Bago and Mr. Puentevella.

The surfacing work on the Manapla–Cadiz Road, in spite of the rain, has been continued up to the Sicaba River. From thereon, surfacing has been done in places which were formerly impassable after a week of heavy rain. All temporary crossings along the road have been fixed up to withstand the traffic. Besides the construction of the provincial road on this section, work is also going on in repairing all the streets in the municipality of Cadiz, for which the municipal council has appropriated funds this year.

Preliminary work on surfacing of the 6 kilometers of third-class road from Valladolid to San Enrique, section of the Bacolod–South Road, was started early last June. At present, 2 kilometers have been finished at a cost of ₱350 per kilometer. The delay in the hauling of gravel from the Bago River, approximately 10 kilometers from the construction has stopped the work.

The Bago–Maao surfacing which has been carried on under difficult weather, labor, and transportation conditions, is nearing completion.

The Bacolod–Murcia Road has this year an available fund of ₱10,000 to be expended. With this amount it is the intention of this office to fix "batches" and to surface those sections which are impassable during the rainy season. The work was started early last May. Delivering of gravel in open to contractors in the locality.

The subgrade on the Talisay–Concepcion Road is nearing completion. Gravel has been delivered on the first 8 kilometers and probably that will be the limit to which this year's appropriation for this project will permit surfacing work.

The subgrade work on the Eustaquio Lopez–Nacayao Road construction is 50 per cent finished. Hauling of gravel on the first 3 kilometers is in progress with the help of some influencial hacenderos in the vicinity of Eustaquio Lopez. For a similar reason, as in the Talisay–Concepcion construction, the balance of the appropriation will not permit the completion of the work this year.

The Pontevedra–Carmen Grande Road is ready for surfacing work. As soon as rolling on the Candaguit approaches is finished and if weather favors, the roller will be transferred to the former mentioned road.

At present the province is maintaining 214.2 kilometers of first-class roads, 23.0 second class, and 255.7 third class, with a total appropriation of ₱100,000. This seemingly big amount is hardly sufficient for the maintenance of the roads above stated, due to the poor quality of avilable surfacing material, which quickly turns into dust under the burden of the heavy traffic. Besides roads, there are 11 ferries which require maintenance also. Ferries throughout the province are rendering satisfactory service this year.

ORIENTAL NEGROS.—The grading on Bais–Manjuyod section, Dumaguete–North Road, from kilometer 53 to kilometer 59, is almost finished. About 3 kilometers of first-course material has already been placed and rolled. It is intended not to surface the heavy fills this year in order to let them settle as much as possible. Some second-course has been placed also. All the necessary pipes have been placed already. Two culverts are yet to be constructed.

Surfacing on Dumaguete–South Road from Dumaguete to Bacon is almost completed. Only 1½ kilometers remain unsurfaced. It is probable that before the end of this year not only the work on this section will be completed but some more work will be done toward Dauin.

The Dumaguete–Luzuriaga Road has been surfaced with first-course material. The second course is now being prepared.

Grading on the Guijulñgan–Libertad section was started last June. Approximate length of finished grading is 2 kilometers.

In the Island of Siquijor, the roads and trails are well maintained.

There were excessively heavy rains during the first three months of the year in this province and in the subprovince of Siquijor, which caused considerable damage to the roads.

The Hilocon Bridge collapsed on February 12, the current having scoured under the abutments.

PAMPANGA.—The biggest construction program of the province will be carried on this year, the total amount of insular, provincial, and municipal appropriations reaching to about half a million.

All the grading of the Magalan–Concepcion and all the surfacing of the Mexico–Magalan Roads have been completed including 2.3 kilometers of surfacing from Magalan toward Concepcion. This project has been pushed foward rapidly by intense supervision and paquiao work in spite of the lack of labor and transportation. Rock was obtained from the foot of Mount Arayat broken at the site and hauled to the road a distance of 6 kilometers for an average cost of about ₱4.05 a cubic meter or ₱0.60 cheaper than the rock otherwise obtained from the quarry at Arayat. Use was made of the school vacation time and even children 14 and 15 years old were obtained for ₱0.50 a day. These children proved in many cases to be better than the older men especially in the spreading of rock. A special allotment of ₱30,000 has been made for this work.

Five kilometers of the Lubao–Hermosa Road have been surfaced. The first 2 kilometers were built with Arayat quarry rock and the remainder with gravel hauled from the Orani River in Bataan. The Orani gravel cost ₱4.50 delivered at the road; that is ₱1 cheaper than the Arayat rock. The surfacing at present reaches Santa Cruz, the most important barrio of Lubao where the municipal building will be probably erected. Santa Cruz is the market of several towns of the province of Bataan. The importance of this road will be increased a great deal if the present plans to establish in Orani the training camp of the National Guard are carried out.

The automobile of the district engineer was the first one to reach Bataan over this road and afterwards the people started to use it to go to Lubao Station to take the train for Manila. Besides being interprovincial, this is a real feeder road promising a good future to the Lubao branch of the Manila Railroad line to the north. As soon as the whole road is surfaced the transportation of heavy machinery from Manila to Bataan will no longer be a problem as it is at present, since the unloading of machinery from the boat is almost impossible. because Bataan lacks good harbors. The location is over a rather flat ridge in sandy rolling country.

All the grading of the San Antonio–Floridablanca Road has been completed and work on the pipe culverts has started. Surfacing material for more than half of the road has been hauled from Gumain River and deposited for ₱4.30 a cubic meter; that is ₱0.70 cheaper than the rock from the Arayat quarry. Few pipes will be required and no structures will be constructed for the whole length of the road. The crossing at the Porac River is fordable during dry season and it is intended to construct an overflow section at the place. This road will help a great deal the sugar central being established at Floridablanca by the Calamba Sugar Estate concern.

The Lauli Bridge on the San Matias–Minalin Road has been completed and work at present is being carried on in the construction of the Panlinlang Bridge. A great difficulty is being encountered in pumping out water from the excavations for foundations of abutments, as there are several springs.

Due to the high cost of building materials and the present limited hydrographic data of rivers the province will construct only wooden bridges for the present.

All the resurfacing of the Bacolor–Guagua Road has been completed a total of 4½ kilometers. This section has very heavy traffic as it is in the center of a commercial district.

About 1,400 mango seedlings have been planted along the San Fernando–Calumpit, Tulauc–San Simon, and San Vicente–Apalit Roads. The planting of mangoes in Pampanga has been a rather hard task due to the many enemies which the mango seedlings encounter in the roaming carabaos, horses, and goats. Great efforts are being exerted to push forward the idea of planting fruit trees along the road. Results up to the present have been satisfactory.

Traffic census taken during the month of March shows numbers more than sufficient to justify the construction of the roads recently completed and clearly proving that money employed in better roads is a good investment earning a high interest.

At Magalan there was during the Spanish régime a demonstration farm run by the Government for the purpose of instructing the people as to farming. When the change in the régime came the whole project was abandoned, but the land is still Government property. On this site the Pampanga Agricultural School will be constructed, very much the same as the Muñoz School at Nueva Ecija. The farm has a good irrigation system furnished by the springs of Mount Arayat and so rice will be its main crop. The provincial board appropriated ₱50,000 for the project. The plans are to build one academic building, two dormitories, one shop and storeroom, one teachers' cottage, and one mess hall. All the buildings will be of a temporary nature except the academic building—a concrete schoolhouse of Standard Plan No. 3. It is expected to spend about ₱30,000 in buildings alone. The road from Magalan poblacion to the farm school will be built this year and will probably cost ₱8,000. Work will start soon.

The roofing of the Guagua Market building is being placed and the sand fill to support the floor was 75 per cent completed on April first. At first the contractors were asking ₱1.20 per cubic meter but on detailing to them the unit cost of the different kinds of transportation to be used, the price was lowered to ₱1 per cubic meter, which is fairly low, taking into consideration the long haul of 2½ kilometers by banca.

Municipal appropriations for bridge and street work ready for expenditure this year run as follows:

Macabebe	₱4,000.00
Minalin	2,000.00
San Luis	2,000.00
Santa Rita	1,500.00
Magalan	800.00
Arayat	800.00
Santa Ana	600.00
Masantol	500.00
Total	12,200.00

Every year the Quitangil River overflows its banks and causes great damage to the lands and crops in Magalan, due to the fact that the fall of the river into the Chico is very small, on account of its winding course. To solve this difficulty, the provincial board appropriated money for a river control which will give the water a shorter distance into the Chico. When the project is completed it is expected the rice and sugar crop will be saved.

A pontoon bridge to go over the Pampanga River at Candaba will soon be erected, this being the only practical bridge for the present. The municipality of Candaba, in a resolution, assumed the responsibilities for the maintenance and operation of the bridge.

The schools at Floridablanca, San Luis, and Candaba have been completed. The Angeles School is at present 65 per cent completed and the municipal officials will appropriate more money, as the present funds are not enough. The municipality of Porac has appropriated the sum of ₱8,000 for the construction of a wooden school house Standard Plan No. 6. The municipality of Masantol has appropriated the sum of ₱18,000 for the construction of a concrete schoolhouse, Standard Plan No. 6. Materials for both the Porac and Masantol schools have been ordered.

A one-story 10 by 15 meters standard presidencia will be erected in the municipality of Mabalacat for which there is ₱9,000 appropriated. At Lubao a two-story presidencia will be built on a new municipal center close to the Lubao–Hermosa Road.

Hydrographic work is being carried on successfully in connection with construction projects, under the able supervision of the assistant engineer.

Municipal street and road work completed has been considerable as can be seen from the following:

	Meters of surfacing.
Arayat	800
Macabebe	2,500
Masantol	2,000
San Fernando	750
Santa Ana	520
Santa Rita	1,580
Total	8,150

At the town of San Luis an earth road 2 kilometers long has been built connecting the barrios of San Carlos and Santa Rita. The town of Mexico has appropriated the sum of ₱3,000 for the construction of barrio roads.

The work accomplished in the district during the semester may be summed up as follows:

(1) Thirteen kilometers of first-class roads.
(2) Eight kilometers of first-class streets.
(3) Fourteen kilometers of improved roads.
(4) Three completed buildings.
(5) Two unfinished buildings.
(6) Four hundred lineal meters of 0.60-meter concrete pipes.
(7) Four and a half kilometers of resurfaced roads.
(8) Two permanent bridges.
(*a*) Road maintenance.

PANGASINAN.—The subgrade for the Alaminos–Bani, Balincaguin–Infanta, Alaminos–Lucap. San Fabian–San Jacinto, and the Santa Barbara–Mangaldan Roads is practically completed, while the subgrade for the Binmaley–San Carlos Road was completed and is now being surfaced. The Santa Barbara–Urdaneta Road, with a total length of 19.4 kilometers, was completed and is now under all kinds of traffic. Repairs on the municipal streets in San Carlos are going on nicely. The street leading to the Farm School which is continuous to the Binmaley–San Carlos Road has been surfaced.

Detail of front pediment, Lingayen Capitol.

The Maramba Bridge on the Calasiao–Santa Barbara Road, consisting of 7-meter concrete slab and girder spans on pile bents, has been completed. A wooden truss bridge on the Bobonan–Camp One Road, and six temporary wooden bridges on the Binalonan–Umingan–Rosales Road were completed.

The capitol building is almost completed. All the structural work is finished excepting part of the wooden work and the outside finish together with the parapet wall of the terrace. The presidencias for the municipalities of Malasiqui and Mapandan are partially completed. The San Fabian Presidencia will be repaired for school purposes. Most of the materials ordered have been received and the work will be started very soon.

The reconstruction of the Manaoag wooden school building, revised Plan No. 6, is now completed and it is ready for occupancy.

Materials for the Santa Maria School building, Bureau of Education revised Plan No. 7, have been ordered, but only lumber has been received. A plan for a school in Labrador is being prepared to accomodate three times as many pupils due to a sudden increase in attendance.

Artesian-well work during the last quarter was extremely successful, wells were drilled in the municipalities of Calasiao, Urbiztondo, and Bayambang.

RIZAL.—The resurfacing on the Manila North road through Caloocan and from the Junction to Malabon has been completed, while the resurfacing on the Manila South Road is progressing very rapidly. All materials have been used as fast as they were received. Occasionally the work has been delayed on account of quarantine.

Another kilometer of first-class road has been added to the Manila East road, costing approximately ₱4,500.

Approaches and causeways to the Navotas Bridge which were started in October are nearly completed. Rizal quarry stone are being used in the surfacing of this road. The work has been rather slow on account of the slow delivery of the adobe stone fill, materials for which are gotten from McKinley.

The Malabon–Navotas bridge, which was started last January, is now completed. This bridge is similar to the Harrison bridge built on the Baroro River at La Union, but is much shorter, as it has only 9 spans. The total structure costing about ₱48,000.

San Juan del Monte–Mariquina Road is practically completed except for a stretch of about 400 meters and this was on account of rain, otherwise the road has been completed.

The timber trestle bridge between McKinley and Pateros was re-advertised and awarded to Mr. Gregorio de Silva, contractor, for ₱5,980. All the piles have been driven, but further construction has been stopped on account of lack of materials.

The road to the Anti-Tuberculosis Colony, through the barrio of Santol, Caloocan, has been completed. The stone and screening used here are from the Los Baños quarry. The total cost of this road is about ₱6,500.

ROMBLON.—The former subprovince of Romblon has been separated, forming, therefore, an independent province since February 22, 1918. In this new province, there are some two millions coconut trees yielding about four million pesos yearly, or at the rate of ₱2 per tree per year.

The total road and bridge revenue in this province this year (1918) is ₱26,461.66 including the ₱4,321.66 unexpended balance in 1917. It is apparent, therefore, that the estimated road and bridge funds available for 1919 will be in the neighborhood of some ₱22,500.

Work will be started immediately on all the existing trails opening them up for horse and cargador traffic for all the year round.

The municipality of Romblon has about 10,000 inhabitants, living in congested and clustered nipa houses on a limited area, at the foot of the hills on the north side of Romblon Island. A fire originating in any of these nipa houses would be beyond control and sufficient to set the entire town on fire in the course of a few hours. To remedy this, the district engineer has suggested to the municipal council of Romblon to fill the present nipa swamp east of town, which is the only place for future town extension. The council has appropriated the sum of ₱2,000 to start this project. The most economical method to successfully carry out this project will be by means of a dredge.

The water supply of the municipality of Romblon is too small to meet the present demand of water consumption in the town itself. The municipality has to divide the supply into halves of the town, closing the supply either in the morning or in the afternoon to the other half, as the case may be, and letting the remaining half be supplied. This water supply was built by the military in the early days of American occupation, sufficient only, according to information, for the consumption of some two companies stationed at that place. To remedy this poor condition, the district engineer has recommended to the municipal council of Romblon to pass a resolution authorizing the district engineer to proceed with necessary surveys and to prepare a plan for extending the said system sufficient to meet the consumption of the town some 20 years hence.

The municipality of Romblon has asked an Insular aid of ₱15,000 for the construction of the present dock. Surveys together with all data pertinent to same are being prepared. Upon completion of plans of present dock and waterfront showing countours of territory adjoining it, soundings and class of materials for foundation, same will be forwarded and submitted to Manila Office for preparing a working scheme or plan for development of the present waterfront and docks. This will serve as a guide in the reconstruction of Romblon docks and waterfront in the future.

SAMAR.—The 1918 provincial road and bridge appropriation, exclusive of Insular aid, amounted to ₱213,956, of which ₱82,600 was set aside for maintenance, ₱88,000 for new construction, and ₱27,000 for equipment. It is intended to make this a first-class road year and with this in view, new surfacing is being placed on 7 separate road sections at present.

The provincial board has requested an insular loan of ₱45,000 for the construction of a bridge for the Bugko River crossing on the Catarman-Laoang Road. This will consist of two 120-foot truss spans of Ipil or Molave on concrete abutments and center pier.

Materials have been ordered for the construction of five additional rooms, completing the standard, Pasig type, 20-room plan, for the Samar High School. The work will be done by administration.

The entire amount of rock for the second contract of 4,700 metric tons for the Calbayog jetty has been delivered and work will be stopped as soon as the final 100 meters of causeway is faced.

The municipality of Calbayog has appropriated ₱4,000 for the extension of their present river wall. There are available ₱10,000 Insular funds for dredging the bar at the mouth of the Calbayog River. It is the intention to use the dredged material to fill behind the river wall and reclaim an old estero that divides the town.

There are ₱10,000 Insular funds available for the Catarman River control. Piles are being purchased and equipment prepared for building hurdles similar to those built in Boac, Tayabas, last year.

Front view, Lingayen Capitol over work sheds.

Owing to the limited amount of money, it is doubtful whether more than two hurdles can be built. Another typhoon season would probably wipe out the town, as the banks are being eroded, at present, at the rate of a meter a day.

The construction of the new block of tiendas for the Calbayog market is practically completed. This single block of tiendas will bring a revenue of about ₱250 per month to the municipality. The main tiendas furnished additional revenue of ₱550 a month, so that the tiendas are a very profitable investment.

The ten-room standard plan, Basey concrete school will be completed this month. Mr. James McGuire of Borongan, the contractor, is the successful bidder on the same type of school in Guiuan and will begin work there as soon as materials are on hand. The contract price is ₱6,780.

The subgrade of the 600-meter branch road connecting the Maulong quarry with the Catbalogan–North Road has been completed. This includes 100 meters of rock causeway, 6 meters wide, and a 3-meter span wooden skew bridge. The construction of the engine and crusher house is almost finished and work of installing the machinery and laying the tracks is progressing nicely. The plant consists of an Austin No. 3 crusher to be run by a 20-Horse Power Fairbanks-Morse engine.

SORSOGON.—All the roads of the province were damaged by the extremely heavy rains of January and February. It was necessary to close the Sorsogon–Gubat Road to trucks during these two months, but repairs were made during March and the road is now again open to all traffic. It will be necessary to resurface practically all of this road as the original metalling is too light to withstand truck traffic. Five temporary bridges on the second-class Gubat-Bulusan Road were washed out and the road damaged in many places.

Surfacing has been placed on 4 more kilometers of the Sorsogon–Albay Road and timber bridges erected over the Ticol and Palje Rivers. This makes the road open to kilometer 9 near the barrio of Bolabog. Considerable trouble was experienced with the road-rolling on account of the frequent rains. No grading has been done further as all the laborers who could be secured have been used on surfacing.

Grading has been finished on the Sorsogon South Road from Gubat to Juban except for a distance of about five hundred meters at the Namuat river. It was expected to have the entire section open to automobiles before this, but the work has been slowed up for lack of labor, and on account of encountering a good deal of rock in the grading at the Namuat River section. Gravel is now being delivered for the Casiguran Juban and Casiguran San Juan sections.

A block of eight single tiendas has been finished for the Sorsogon market and all are now occupied, the average rental being ₱20 per month for each tienda. A second block of five tiendas is now under construction and should be ready by August 1. It is expected that funds will be made available to construct another tienda this year.

The Lumbang–Milagros Road has been graded and a surfacing of gravel has been placed. Work is now being started on the culverts for this road. Five kilometers of the Masbate–Mobo Road are now being graded and surfaced.

Insular funds were alloted to finish the bridge over the Guinobatan River on the Aroroy Mining Trail and advertisements for the lumber and labor were published locally, in the hopes that some of the mining companies would undertake this work, as they are well equipped to do it. No bids were received however and the work will be done by administration.

The price of hemp still continues very high with the result that labor is very scarce and the class of the labor which is available is unusually poor and indifferent. This has made all work quite difficult and expensive and there seems to be no reason to hope for an improvement in the future, unless the price of hemp takes a decided drop. Sufficient gravel has been delivered. Surfacing will commence as soon as the road roller arrives.

Most of the materials to be used on the construction of the Peñablanca Presidencia Building have been received, and as soon as the work on the construction of the Provincial Exposition Building is finished, its construction will be started.

The east and west wings of the Provincial High School have been repaired but work is now suspended owing to the impossibility of securing lumber locally. In these wings new concrete harrigues have been placed to the second floor and on the top of these new wooden harrigues have been placed to the roof, new floor beams and stringers have been placed where the old ones were found to be rotten or anay-eaten, the original double partitions have been replaced by single partitions, and floors repaired as needed.

Due to the continued high price of hemp, labor is very scarce and quite inefficient and all road work is being done under the "paquio" system.

SULU.—The municipality of Jolo by resolution placed the maintenance of all streets, sewers, pipe lines, and parks under the direction of the district engineer, beginning June first. Due to the conditions that have always existed in this municipality it is necessary to maintain a large police force. This circumstance, coupled with the repayment of a market loan to the Insular Government, drains the municipal coffers and allows very little for proper maintenance and reconstruction of the municipal streets. When their condition became alarming, a small appropriation (₱4,000) was made and the district engineer was requested to take them over. It may be possible that we can maintain them, and make some repairs in addition, but considerable more funds must be made available before any appreciable difference in appearance can be accomplished on the badly rutted and worn main streets of the town.

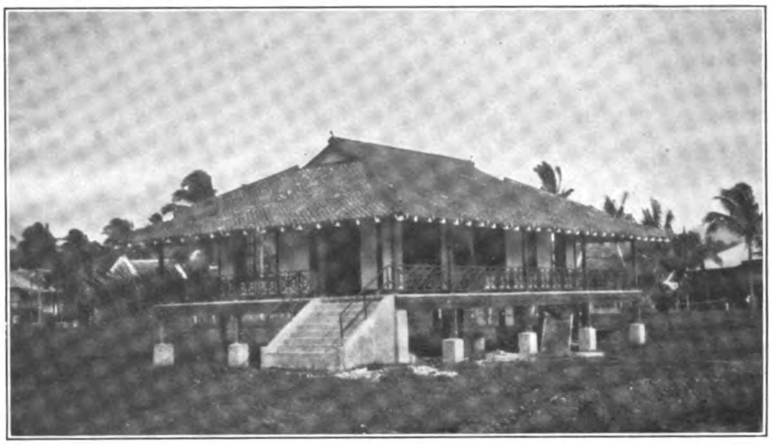
The provincial road passing through the municipality to the wharf was ordered resurfaced from provincial funds. These two projects have been combined as to the equipment and workmen and good results are being obtained to date. A complete crushing and transportation outfit, with crusher, elevator, rock bins, tramway, motors and road roller has been assembled and is operating on the main street of the town. The old surfacing is rolled before placing rock. As the town is of filled material the settlement is sufficient for placing 6 to 8 inches of rock. A Telford base is being used on especially soft ground. The plans of street repair and reconstruction for Jolo involve the raising of approximately 2 kilometers of road and at the rate funds are being made available it will take two years to complete the work.

View into ram shelter showing two rams operating at full capacity in Sulu.

With reference to waterworks, the municipality of Jolo is in the queer position of having two completed pumping and supply plants, with an inadequate distributing system in such bad shape that it will not hold the water delivered to it. There is a balance of ₱3,000 from the appropriation of 1917. The Gandasulig pumping plant has been completed. This money is being used on the relaying of distributing mains in the city. A new 6-inch line is replacing the old Spanish 4-inch main which was the supply line for the whole municipality. This 6-inch main supplies only a portion of the town of Tulai. Unless funds are made available in sufficient quantities to take up the debt of the province of over ₱35,000 in completing the military ice and pumping plant and also to continue construction of the distributing system, the work will be suspended and the municipality will have to worry along until next year.

The so-called military water system has finally been completed and is delivering water to the municipal pipes. The cost of the system is not obtainable accurately by this office as this was a special project under the supervision of the governor of the province of Sulu, with a United States quartermaster corps engineer in charge.

The teachers' cottage at Maubo completed last January has been covered with a clay tile roof. These tiles were made in Zamboanga and it is the first building in Sulu covered with home-made clay tiling. The area of this roof is 120.8 square meters. The tiling, plus over 15 per cent breakages, and transportation, cost ₱283.40. The labor for laying the roof was ₱115.36. Cost per square meter ₱3.30. The roof is a trifle short of absolutely water proof, but this is undoubtedly caused by the slope being not sufficient to run the water rapidly. All other buildings which will have tile roofing are being constructed with the proper slope found experiment.



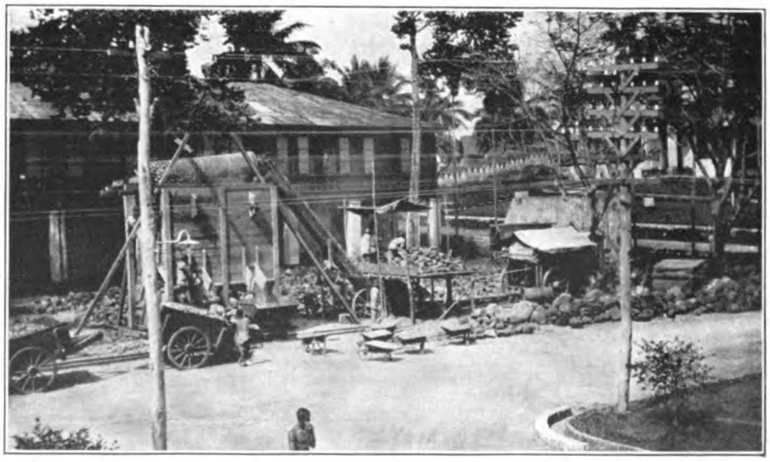
Domestic Science School at Jolo, Sulu.

A record was made in the construction of the Domestic Science School in the municipality of Jolo. The first foundation pile was driven on January 4 using a hand pile driver and the last tile was laid on the bathroom floor on June 15. The estimated cost was ₱7,000 and the actual cost will be a few pesos less. The plan of the building is the same as for those constructed in the north. The framing of the building is timber, the roof covering is clay tiling. The floors are a combination. The sala and bedroom have wooden floors. The kitchen, pantry, bath and the porches have colored cement tile laid on a tight wood flooring. That part of the building which is to receive tile flooring has the floor 2 inches lower than the wooden floor. On this a bed of cement is spread 1½ inches thick. The 6-inch square tile are then bedded down into the damp cement. The tile are ¾ inch thick. All joints between the tile are ¼ inch wide and are filled with cement shaded black on the porch and white in the bathroom and kitchen. Modern plumbing will be installed with an additional appropriation soon to be made available. This building is also covered with clay roofiing tile made in Zamboanga. The roof tile are completely successful. The cost data is as follows: Area of roof 7 by 13.15 meters, 309 square meters. Cost of tile, ₱740.70. Cost of labor for laying, ₱219.04. Total cost, ₱959.75. Cost per square meter, ₱3.10. The cost was increased by the heavy percentage of breakages in transit. All the labor with exception of driving piles was accomplished under contract by M. Nacagawara, of Jolo.

An appropriation of ₱10,000 has been made for the construction of a five-span concrete bridge over the Legian River at kilometer 1.5 on the Jolo–Maimbung Road. The type of bridge will be the flat span set on abutments constructed over concrete piling. Construction begins July first.

All the United States military buildings in and about Jolo were turned over to the civil authorities when the post was abandoned. These buildings are now being repaired and maintained by the office of the district engineer of Sulu.

Two kilometers of first-class road have been completed on the Jolo–Taglibi Road beginning at station kilometer O. The width of



Rock crusher (Champion) at work in Jolo, Sulu.

road bed is 7 meters with a 4.0-meter surfacing, 25 centimeters thick of first-class broken rock; all culverts are of reinforced concrete, concrete pipe or Armco ingot iron.

One teachers' cottage has been completed at Culay Culay, Island of Jolo. The plan is a special one made at Jolo. The cottage is 6.5 by 11.5 meters; has hard-wood framing, tanguile siding and floors, and clay tile roof. Total cost ₱2,235.67. This type of cottage has been made standard for Sulu.

A one-room school building is also under construction at the same place. It is a modified standard plan school substituting wood for concrete and clay tiling for the galvanized-iron roof. The school situation in Sulu demands the rapid construction of semipermanent buildings to house the many applicants for admission to the schools. Concrete schools would be costly and require a much longer time for construction, which forced the school authorities to accept semipermanent construction.

Two teachers' cottages on the same standard semipermanent plan are under construction at the Lapak Agricultural School at Rugasan, Island of Lapak. The labor for construction of same is under contract to M. Nacagawara, of Jolo, for ₱850 each. The estimated cost of each cottage is ₱2,200. This farm school is being highly developed. An artesian well will be drilled and a complete water system installed to supply all the buildings of the plant. Concrete rainwater storage tanks will be constructed for each building in addition to the well supply.

The surveyors are now working on the proposed Siasi Waterworks preparatory to beginning reconstruction of the present pipe line and constructing the distributing system. Water is supplied by gravity from a spring and reservoir 3½ kilometers from the town and at an elevation of 55 meters above mean high water. The supply is more than sufficient for the demand.

All the material for a one-room school has been delivered on the Island of Lugus but construction has not begun due to the presence of outlaws on this island. Carpenters and laborers will not remain there unless a heavy constabulary guard is provided for them. The trouble, it is hoped, will soon be cleared up and peace will again reign in Sulu.

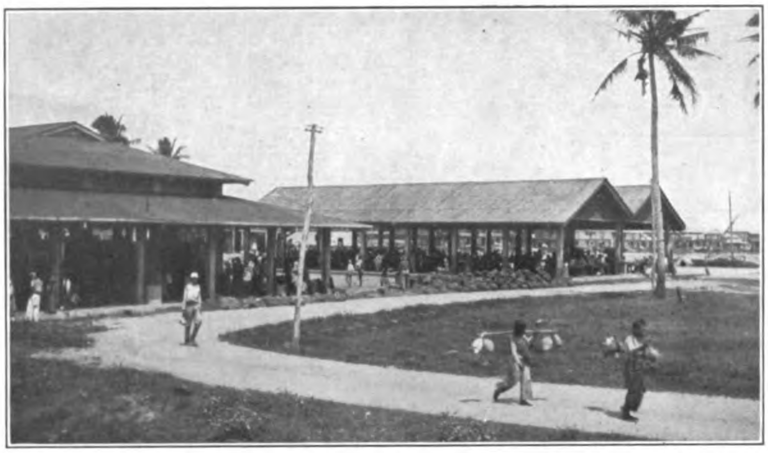
Plans and estimates for the Lapak Dormitory have been completed and the office is now engaged on plans for 3-room and 4-room schools of the semipermanent type which are to be constructed during this year at Maimbung and Siasi.

The provincial shops of Sulu have recently been reorganized and enlarged. The question of shops has been a difficult one to handle, as all operation must, under current regulations be under the provincial treasurer. But the district engineer of Sulu has more interest in the shops than any other official or individual, as two-thirds of the work accomplished by it is for district engineer projects. The supervision of work, the order of production, the enlargement of the shops and the material necessary have been the points under discussion. Various difficulties were encountered while the shops were operated solely by the provincial treasurer. A conference was finally held by the provincial governor, secretary-treasurer, and the district engineer, at which an agreement was entered into that shops would be operated by the provincial secretary-treasurer under the direct supervision of the district engineer. The office of the district engineer receives 4 per cent of all work accomplished, the shops receive 10 per cent for the shop fund to be used for purchase of machinery and the provincial treasurer receives 6 per cent for handling of accounts. A clerk is provided for the shops, under the direction of the district engineer, who accomplishes all records, data, and statements for work. The trading system collects the money due. The shops have been expanded to include machine, blacksmith, marine, plumbing, carpenter, and cement utilities shops. A superintendent is in charge who also operates the provincial ice plant and water pumping station. New additions to the shops are under way and a slipway will be constructed in the near future. Copies of the agreement, method of shop operation, and forms used can be secured, if any district engineer is interested in this method of solving the shops problem.

A temporary market 10 by 30 meters has been completed in the municipality of Indanan. This style of market is supposed to have a life of five years. The posts are hardwood, the roof trusses bamboo and apitong, and the covering nipa. No floor is laid, simply placing tables and benches on the gravel covering. The cost was ₱1,368.

The pile driver for the repair of the Jolo Wharf and other docks of the district is about completed. Driving of piles for fenders and replacement of decayed underpining will begin during the early part of July. A new floor will also be laid. The wooden wharves at Cagayan de Sulu, Siasi, Sulu, and Bongao, Sulu, will be repaired later in the quarter. New wharves are being constructed at Sibutu, Loa, and Bas Bas by private individuals engaged in the railroad tie industry. The province is assisting by furnishing iron fittings and a hand pile driver.

Telephone line reconstruction has been completed between Camp Andres and Siet Lake and Jolo and Romandier. Hardwood posts have replaced the third-group timber originally used. Further reconstruction is necessary on all the present lines.



Old and New Jolo Markets, Sulu.

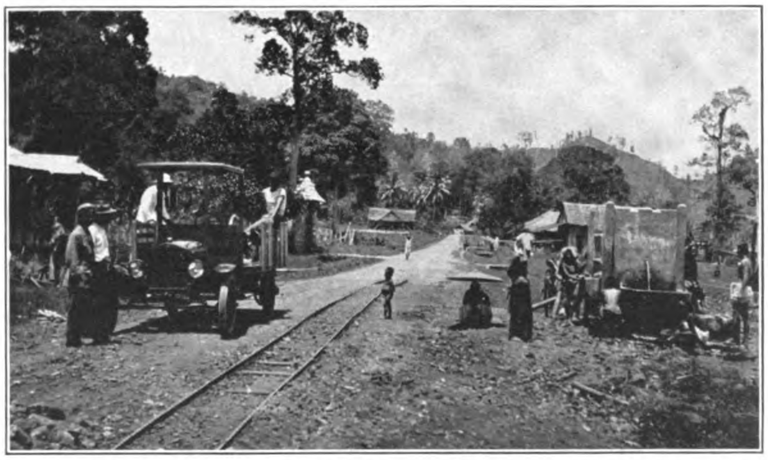
A kind Providence has reduced the rainfall to only 4 to 8 inches a month in the various parts of Sulu, which has allowed us to repair the first-class roads to such an extent that the roads of Jolo are now in better shape than at any previous period. Not a truck has been stopped, or a road closed, for the past four months. Six new trucks are operating on the roads in addition to the former number. Some of our success can be attributed to the excellent quality of rock which has taken the place of the soft material previously used for resurfacing. The new rock crusher, tramway equipment, and steam drill outfit have made it possible to quarry and crush good hard rock for surfacing the roads.

Two kilometers of first-class construction have been completed on the Junction No.1–Parang Road, and opened to traffic. Width of road bed 7 meters; surfacing, 4 meters. One-half kilometer additional has the subsurfacing about completed and the placing of surfacing rock will begin in a few days. A large deposit of gravel and boulders has been discovered ½ kilometer from the construction sections of this road. A quarry and gravel pit has been opened and approximately 1,000 cubic meters have been taken out and placed alongside the road for crushing and spreading.

This solves the good-rock problem for at least 8 kilometers of the Parang Road, as more than 8,000 cubic meters of rock are in sight. All culverts and bridges are of a permanent characters. A 1 by 2½ meter rainforced concrete culvert is under construction.

Two temporary wooden bridges on the Parang Road between kilometers 7 and 10 have been replaced by plain rubble masonry 2-meter arch culverts. The country abounds with large boulders and it was decided to use this material with the sand and gravel which existed in the streams in sufficient quantity for culvert construction, with the addition of imported cement only. The plans were made in this office and approved by the Director. The result has been a massive permanent arch culvert on the Spanish style and appearing on the outside like a reinforced concrete arch culvert. The average cost of two 2 by 2 meter culverts was ₱1,246.79.

Reconstruction work is being carried on in kilometer 2, 3, and 6 of the Jolo–Junction No. 1 Road. A new line has been surveyed up the slopes of Tumantangis with a maximum grade of 5.5 per cent,



Parang Road, first-class construction at Indanan, Jolo, public fountain on the right.

Rubble Masonry Culvert without wing walls, at kilometer 8.44 Parang Road, Sulu.

which when completed will eliminate grades up to 10 per cent. These 6 kilometers of road have been the source of more trouble than any other piece of road in Sulu. Being the main road out of Jolo, construction will be pushed as funds become available.

Preparatory to the reconstruction and resurfacing of the Maimbung Road between kilometers 7 and 16, good hard surfacing rock is being quarried in kilometers 9 and 13. At Maimbung rock is being delivered by boat from a seashore rock deposit at a contract price of ₱1.60 per cubic meter. The rock will be crushed before placing on the road.

An effort is being made to solve the labor question on road construction by using the percentage method of contracting. On the Siet Lake Road Contractor Thompson is at work in kilometers 13 and 14 under a plan of which the following is a brief sketch, with reasons for using it:

The Moros of Jolo who labor by the day are a happy-go-lucky set and live up to each day's pay. It is very difficult for them to wait two weeks to be paid. In fact they work only a few days each quincena and then disappear until pay day. It was found that contractors could secure all the laborers needed when they were given a small advance and paid every few days. To use this method in our office involved more work than the clerks available could attend to and our 4 per cent surcharge would provide for. Again, contractors always bid such figures as will assure them, with normal conditions, at least 100 per cent profit. Many bids for road work have been rejected on this account. It was decided to try the percentage basis of contracting as conducted in the United States. A contract was entered into providing that the province would pay on regular pay rolls and issue vouchers the actual costs of labor performed under the direction of the district engineer and as per plans and specifications provided and would pay the contractor 20 per cent of the amount of labor and of cost of material used as his returns on contract. All labor is secured by the contractor and paid by him. He submits payrolls certified to, by the inspector-timekeeper for this office, who is on the work at all times, at the end of each quincena, which is paid him plus 20 per cent of labor and material costs. This plan was approved by the Insular Auditor. A model camp for Moros has been constructed at provincial expense and the plan to date has been very successful. Plenty of laborers have been secured, in fact more than necessary. When an effort is made to turn the excess laborers to other projects not operated on this plan they disappear. This same plan will be put in operation on the Parang Road at an early date.

The question of permitting a new transportation company to begin operations in a provnice which is already supplied with sufficient transportation has arisen in Jolo. The old company threaten a rate war and their program of operations to drive out the new company involves using twice the number of cars and trucks making more trips than necessary, which will react in a deplorable manner for our roads. A constant struggle is foreseen to keep the roads in condition if the new company starts operations. A protest was made to the department attorney for Mindanao and Sulu, who decided that nothing could be done to prevent the new company from beginning operations. The matter will be taken to the provincial board, in case the competition between the companies results in ruinning the roads of Jolo.

SURIGAO.—The repairs of the Placer–Mainit and Surigao-Badas Roads which were damaged by the extraordinary rainfall last December and January have been completed, and the camineros are now doing the regular maintenance work.

Great interest is being taken in the planting of shade trees. During the first quarter nearly five hundred nancas were planted and most of them are now about a meter high. Santol, lanzones, and other fruit bearing trees will also be planted when rainy season begins.

Fifty laborers from Cebu have just arrived, and within two weeks from now fifty more will be coming. They are all assigned to the construction of Surigao–Badas Road, at kilometers 15 and 16, doing grading work. The force is being concentrated at this place with the object of prolonging the road up to Sison, which is the first barrio from Surigao to Placer. The frequency of rains in this district, together with the kind of soil used for subgrade, make it unwise to build unsurfaced roads. Experience has demonstrated that the unsurfaced roads in this district can only be used during three or four months in the whole year, in spite of the constant maintenance done. The present policy therefore is to grade just a kilometer or two ahead of the section that is being surfaced.

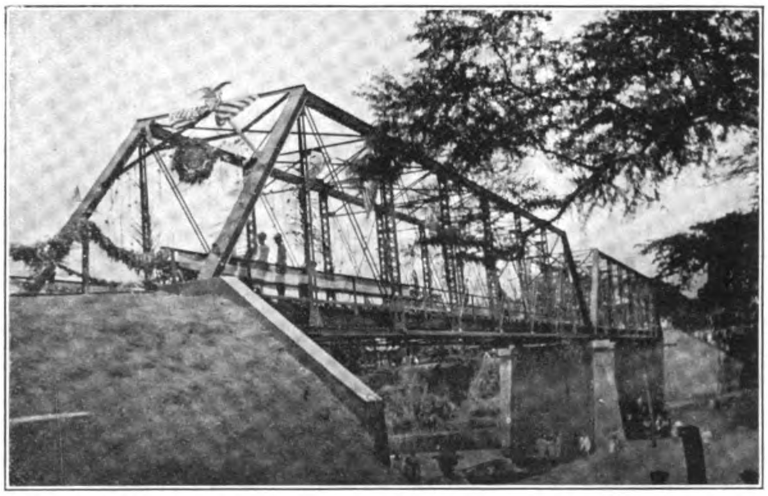
Aliten Bridge, at kilometer 9.10 on the Surigao–Badas Road, is now completed. This is a trestle bridge of 15-meter span, and roofed with nipa. Another bridge of the same kind is being built at Anajao, kilometer 11.2. Mancono timber, which is as permanent as concrete, is used for piles. First or second group timber, which can be gotten in the vicinity of the site, is used for brams and flooring.

As soon as materials are ready, improvements of the Bilanbilang Road near the port area, and the repair of the wharf will be begun. The provincial board has appropriated ₱1,000 for these projects.

Tandag Central School, Standard Plan No. 7, Bureau of Education, has been advertised, the bids to be opened on June 29. This work will probably be done by administration as it is very likely that no bids will be received.

TARLAC.—Owing to the shortage of labor, it is feared that nearly all the public works in this province will be suspended during the months of July and August until the rice planting season is over.

The maintenance of first-class roads in this province during the first quarter has been very unsatisfactory due to the combined effect of heavy traffic, lack of railroad cars, and other means of transporting materials, and it is feared that if this condition prevails for a long time most of the first-class roads will have deteriorated to such an extent that reconstruction will be necessary.



View of the Camiling Bridge just before inauguration. Note the decoration.

One of the greatest events in the history of public works in Tarlac was the completion and imposing inauguration of the Camiling Bridge. Senate President, Hon. Manuel L. Quezon, with the Honorable Secretary of Commerce and Communications, Senators Gabaldon and Liongson, and Governor Soriano, of Cavite, arrived at Camiling on May 26, and immediately proceeded with the solemn inauguration of the bridge. Between ten and twelve thousand people attended the inauguration.

About six hundred lineal meters more of road is to be finished on the Gerona–Pura section of the Tarlac–Guimba Road. It is expected that before the end of July next the province will complete the Tarlac–Guimba Road which is expected to be connected with the Manila–North Road at Guimba.

The construction of Santiago Bridge is well underway in spite of the scarcity of labor in this province. The whole substructure for the main structure is now finished. Great difficulty was encountered in the transportation of the materials for this bridge from Capas to the bridge site, particularly the heavy members of steel span which could not be loaded on ordinary bull carts. In order to remedy the situation specially made bull carts were attached to a road roller to haul the heavy members.

Upper row showing Senate President Quezon and committee just before the inauguration of Camiling Bridge.

Front view standard market at Tarlac on the Manila-North Road. View taken on market day.

Construction of Victoria Central School is going on very slowly due to the difficulty of transporting material for this building from the Tarlac railroad station to Victoria.

The Tarlac–La Paz Road would have been completed long ago, but the scarcity of laborers and transportation delayed the work considerably.

The construction of the Tarlac–Murcia Road has been resumed, after being suspended for over two months, and is now progressing very slowly.

The construction of the Camiling–San Clemente Road, is also retarded owing to shortage of laborers and means of transporting materials, but better progress is being made than on other projects in this province.

TAYABAS.—Road maintenance during the quarter has been confined to ordinary patrol work, with the exception of some resurfacing on the Lucena–Sariaya section, and the application of considerable sand top-dressing to the Tayabas–Lucban section. Lack of suitable material continues to be the greatest problem. Lumber has been ordered for the new quarry installation, but some time will elapse before stone production can begin.

Candelaria Bridge construction is progressing rapidly. Lack of splice pins and bolts has delayed the erection of the trusses, and the approaching rainy season renders it necessary to make the structure self-sustaining at the earliest possible moment. The yacal, ipil, and molave lumber furnished by the Bureau of Supply for this structure were exceptionally good material and the life of the completed bridge should exceed the estimate.

The entire subgrade of the Atimonan–Siain Road has been connected up, and fair progress is being made on surfacing. With the exception of installing a few pipe culverts, the road has been completed to the Barrio of Talaba, 5 kilometers from Atimonan, and nearly all the stone is prepared for the remainder of the road as far as Siain. Progress should be rapid during the ensuing quarter. The increase in wages from 80 to 90 centavos per day has not materially bettered the labor situation.

Construction of a road to connect Sariaya with its railroad station, at Bucal, has been started. This road will be about 6 kilometers long and follows the old Spanish road which connect Sariaya with the sea, at the Barrio Canda. It traverses a very productive coconut-growing locality and will shorten the haul for much of the coprax grown in Sariaya.

Work has also been started on the road connect Lutucan railroad station with the Manila–South Road. Lutucan is a barrio of Sariaya, and is on the old vicinal road leading to San Juan de Bokbok. The growth of this barrio has been little short of phenomenal, and the added stimulus of a connecting road should be very noticeable. About 2.5 kilometers of first-class work are involved in this project.

Grading has been started on the Lucban–Sampaloc–Mauban Road. The force of laborers is very small and progress will be slow during the rainy season.

It rains, on an average, about 300 days per year at Lucban.

An appropriation of ₱10,000 for repair of the Tiaong–Dolores Road is now being utilized. An effort will be made to grade and surface a few kilometers of this road, which leads to the railroad station. The work will be left in such condition that it will stand up during the rainy season, and will later be incorporated in first-class construction.

A small amount of street construction has been done for the municipality of Lucena; and the construction of a street leading to the railroad station at Pagbilao has been undertaken at the request of that municipality.

Lopez Market building construction proceeds slowly. Great difficulty has been encountered in obtaining good sand and gravel for this project. Grading material will also be difficult to secure, as the surrounding country is low, rice-paddy land.

The Plan No. 7 building at Sariaya was completed and occupied during the quarter. Material cost was very high on this project. Hy-rib partitions cost practically the same as monolithic partitions, and were difficult to construct. Manganese oxide blackboards were provided, and while the finish is excellent, efflorescence gives them a grayish cast, in some cases.

A domestic science building has been advertised for construction in Tayabas, and will be constructed by administration.

During the months of January to March inclusive the high-school students have voluntarily graded a large part of the athletic field. The province furnished tramway and other equipment and set stakes for line and grade. The actual grading was left in charge of Mr. Carl of the high-school Faculty, and through his interest, and the consistent effort of the students, the grounds begin to show promise of future excellence. If a suitable light power roller can be obtained, the track will be surfaced with volcanic ash during the present season.

Repair of Gumaca Bridge, a reinforced concrete, slab and girder structure was started on March 2, with Mr. L. H. Thompson, mechanical engineer, of the Bureau, in direct charge. The Bureau sand-blast machine and cement-gun are being used, and appear to be well adapted to the work. The old concrete surrounding the heavy reinforcement at the bottom of the girders is knocked off with hammers and chisels, and the sand-blast removes the rust from the exposed steel. The cement-gun shoots on a new concrete covering for the steel, and the upper part of the girders, floor, etc., can then be repaired.

The repair of the bridge was completed during the first quincena of June. Six spans were repaired. No attempt was made to repair the floor or balustrade and it will be of interest to note whether corrosion of the steel progresses downward from the untouched, rusty, reinforcing, or whether it is caused by penetration of salt, air and moisture through the coating applied with the cement gun.

Mr. Thompson's article, in this issue, describes the work in detail.

Under the direction of the treasurer, considerable telephone line construction is being done. The facility of communication with adjoining towns is of great assistance in executing public works.

A Ford 1-ton truck has been purchased, from general funds, and will be operated by the treasurer. The body will be constructed locally, according to Bureau plans.

Good progress has been made on improvements to the provincial grounds and buildings. The garage is now in good condition and grading for the proposed public plaza has been practically completed. The provincial building has been painted, inside and out.

Hydrographic measurements are in progress on four streams in the province. Several water-right investigations have been made, and additional data for two proposed waterworks systems obtained.

MARINDUQUE (Subprovince).—The declared first-class road system is reported in good condition.

Ihatub spillway, between Boac and Gasan, is practically completed. Pumping tests are under way at Gasan, in connection with the investigation for a proposed waterworks system.

A survey was completed for a small water-supply line for the town of Mogpog.

An allotment of ₱13,500 has been announced for the Santa Cruz waterworks system. This project has been under consideration about 10 years. Construction of Mogpog–Balanacan Road progresses slowly, through scarcity of labor. The grading is approaching Balanacan.

Surveys have been ordered for a proposed capital center at Boac, in preparation for the organization of Marinduque as a separate province.

ZAMBALES.—The whole section between Subic and Castillejos is now constructed first class with the exception of kilometer 66, the Subic Hill. A project of diverting this road to avoid the heavy grade over 10 per cent is being considered and plans are being prepared for submission. The total of 7 kilometers has been constructed and the average cost per kilometer was ₱3,200. This, however, does not include rolling as the road has been constructed without the use of rollers, the province possessing no roller at present.

The rate of pay of laborers in the south has been increased from 50 to 70 centavos per day in order to attract more laborers, but, in spite of this, labor is still very scarce.

An allotment of ₱25,000 has been received. This will be used to continue the construction of Subic–Castillejos Road to San Marcelino.

Repair has been made at kilometer 36 to 37 near San Narciso, to prevent a creek cutting into the road. Repairs have also been made on the worst places between Iba and Subic.

In the north, 2 concrete pipes have been constructed and the narrow wooden bridges at Bambam Lumboy, and Murallon, between San Lorenzo and Masinloc have all been widened and repaired.

All first-class roads and proposed first-class roads are being planted with lumbang seeds according to the latest Bureau Circular on tree planting.

The temporay bridge at Bato has been widened and repaired and is now passable for carts. The worst section on the Palauig Road, kilometer 15, has been repaired and lightly surfaced with finger coral and is now in good shape.

The road on San Lorenzo hill, kilometer 19 to 21, has been improved and all wooden bridges have been replaced by pipe culverts.

Repairs have been made to the provincial building offices for the clerk of court.

ZAMBOANGA.—A contract for furnishing materials and installing complete, two concealed conduit systems for the electric lighting and electric clock systems for the Zamboanga Normal School, has been awarded to the Harry E. Keeler Co., of Manila. The amount of the contract is ₱3,738.

Approximately three-fourths of the footings for the Zamboanga Normal School have been cast and the greater share of the filling is completed. It is hoped to have the building well above the first floor line before the rainy season begins.

Labor contract for the reconstruction of the Isabela River bridge has been awarded to the Basilan Lumber Company for ₱1,551.87. The bridge is a combined wooden pile and truss structure.

A provincial appropriation has been made available for extending the Cawa-Cawa Road along the beach to the barrio of Baliwasan, a distance of 1 kilometer. This road will give access to a number of commercial bodegas located along the beach beyond the city limits.

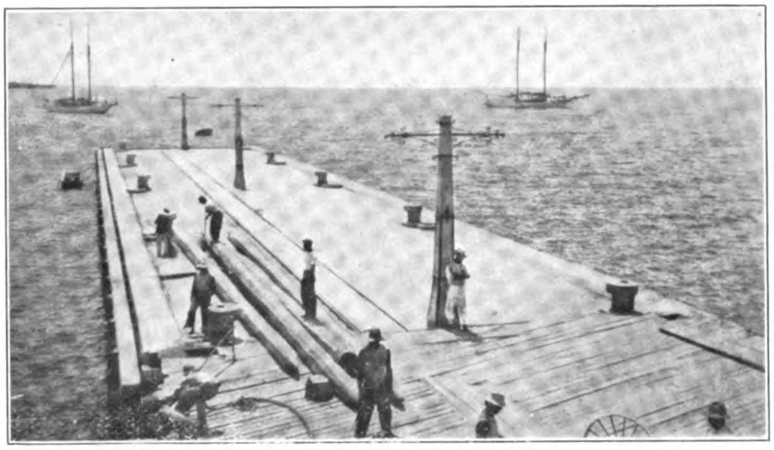
The replacing of the wooden members of the Tumaga River bridge has recently been completed by administration. This bridge is a wooden truss bridge of 50-foot span and was originally constructed of yacal timber in 1906. After 12 years service the wooden members were still fairly sound except at the joints and where water had entered the wood around the tie-rods. All joints and tie-rod connections on the replaced members have been thoroughly waterproofed with asphalt pitch and it is believed that the life of the new bridge will be much longer than that of the former structure.

The Zamboanga East–Coast Road has been declared first class and opened to truck traffic as far as Manikaan, a distance of 25 kilometers.

Considerable surveying is being done on the Island of Basilan for the purpose of deciding upon a definite road and general public works program.

Excavation is being made for the concrete abutments of the Manikaan Bridge and materials have been ordered for the construction of the entire structure. The bridge is an 80-foot wooden truss placed on concrete abutments capable of later supporting a steel structure.

A Bureau of Public Works well rig has been shipped to Payao for the purpose of drilling a well at that town for the National Coal Company. After the completion of the well, the rig will be used in drilling a few test borings at the coal fields. All expenses are being paid by the National Coal Company.



Views of the concrete extension, Zamboanga Wharf, Zamboanga.

The tilting pile driver used for driving the concrete piles on the Zamboanga Wharf extension, has recently demonstrated its usefulness as a derrick. By tilting the loads forward, it was possible to lift two launches from the deck of the steamship *Romulus* and lower them into the water. The launches, weighing approximately 9 tons each, were shipped from Manila for the National Coal Company and proved too heavy for the ship's boom.

The construction of a 30 by 80 foot lighter for the Department of Mindanao and Sulu has been completed. The Crescent Star Dock Company furnished all lumber and constructed the lighter under contract for the sum of ₱7,000. Hardware, iron, felt, pitch, oakum, etc., were furnished by the Government at an approximate cost of ₱3,000. The lighter, besides being used for general cargo purposes, was constructed with one square end which makes it especially adaptable for use with a pile driver.

The asphaltic pavement on the new concrete wharf has been completed. Asphaltum was furnished by the Standard Oil Company and the work was done in accordance with the instructions of their expert. A satisfactory and inexpensive cooker was made out of sugar kettles. Eight of these were suspended over a clay fire box reinforced with scrap iron. Pieces of reinforcing steel were used for grate bars, and the stack was constructed out of old cement drums. Two kettles were used for heating the asphalt, two for heating the sand and four for the rock. A very hard and smooth wearing surface was obtained and unless time develops unexpected troubles, it will make an excellent protection for the concrete slab. The concrete wharf extension to the Zamboanga pier was completed in February. The extension is 63 meters long, 12 meters wide and is supported by 125 reinforced concrete piles, 50 by 50 centimeters.

SELECTED.

ARE YOU GAME OR ARE YOU A QUITTER?

[Author unknown.]

How about it—have you backbone sufficient to stand up and take the blame which is yours?

The chances are that every time you think it possible to blame some one else in order to save yourself you do so.

Did you ever stop to think how cowardly this is?

Why not be fair enough and big enough to admit your failure has been the cause of a whole system being put out of gear?

Hiding behind another when you should stand out in the open and take what censure belongs to you is like a soldier running behind a comrade during the heat of battle. Same principle.

Come out like a man and admit you are guilty when you know you are.

Any man who amounts to anything in this world makes mistakes. Bound to.

If you hold back from taking a step in any direction because you are afraid you will make a mistake, you will never get anywhere.

Go ahead. But if you make a mistake, don't try to shift the blame.

[*Graphite.*]

Appendix A.

CIRCULAR LETTERS ISSUED BY THE CONSTRUCTING DIVISION FROM APRIL 1, TO JUNE 30, 1918.

Manila, P. I., *April 24, 1918.*

Constructing Division Memorandum No. 8.

Sir: Before any request is forwarded to this Bureau for making repairs to machinery and equipment, or for fabricating parts of machinery and equipment, a resolution of the provincial board authorizing either (1) all such repairs for the calendar year named in the resolution, or (2) the repairs mentioned in the particular request, must be secured and forwarded either with or prior to the request itself.

Also, each individual request for making repairs of fabricating parts, and each requisition on this Bureau for supplies purchased. not furnished gratis, must bear the approval of the provincial treasurer.

For the Director:

W. C. West,
Acting Chief Constructing Engineer.

To all District Engineers,
Supervising Engineers,
City Engineer, *Baguio,*
Mr. L. E. Williams, *Chief Accountant,*
Mr. Jose del Castillo,
Mr. R. H. Treash, and
Mr. A. W. Wolf.

Manila, *P. I., May 23, 1918.*

Constructing Division Memorandum No. 9.

Sir: Immediately upon receipt of authority to proceed by administration with the construction of any building, you are directed to forward a requisition for the builders' hardware and for the plumbing and electrical materials, fixtures and fittings mentioned in the specifications of said building. Every contractor, as soon as his contract is signed, should order these materials at once from the United States, unless same can be obtained in the local market, in order to have his contract time extended because of delay in the delivery of such materials, and you are directed to so notify him.

Prompt compliance with the provisions of this memorandum will enable the Purchasing Agent to substitute from the local market when authorized by the Consulting Architect to do so, or to place the order promptly in the United States.

This requisition may be submitted separately from that for the rest of the materials of the building, if you so desire.

For the Director:

W. C. West,
Acting Chief Constructing Engineer.

To all District Engineers,
Supervising Engineers,
Consulting Architect,
Designing Division,
Mr. R. H. Treash, and
Mr. Jose del Castillo.

Manila, *P. I., May 23, 1918.*

Constructing Division Memorandum No. 10.

Sir: 1. Attention is invited to paragraph 4 of Bulletin No. 6 of the Philippine Constabulary giving the general information and rules promulgated by the Director of the Bureau of Mines, Washington, D. C., for the enforcement of Act of Congress of October 6, 1917 (Public No. 68, 65th Congress) regulating the manufacture, distribution, storage, use or possession of explosives or their ingredients, which, in part reads as follows:

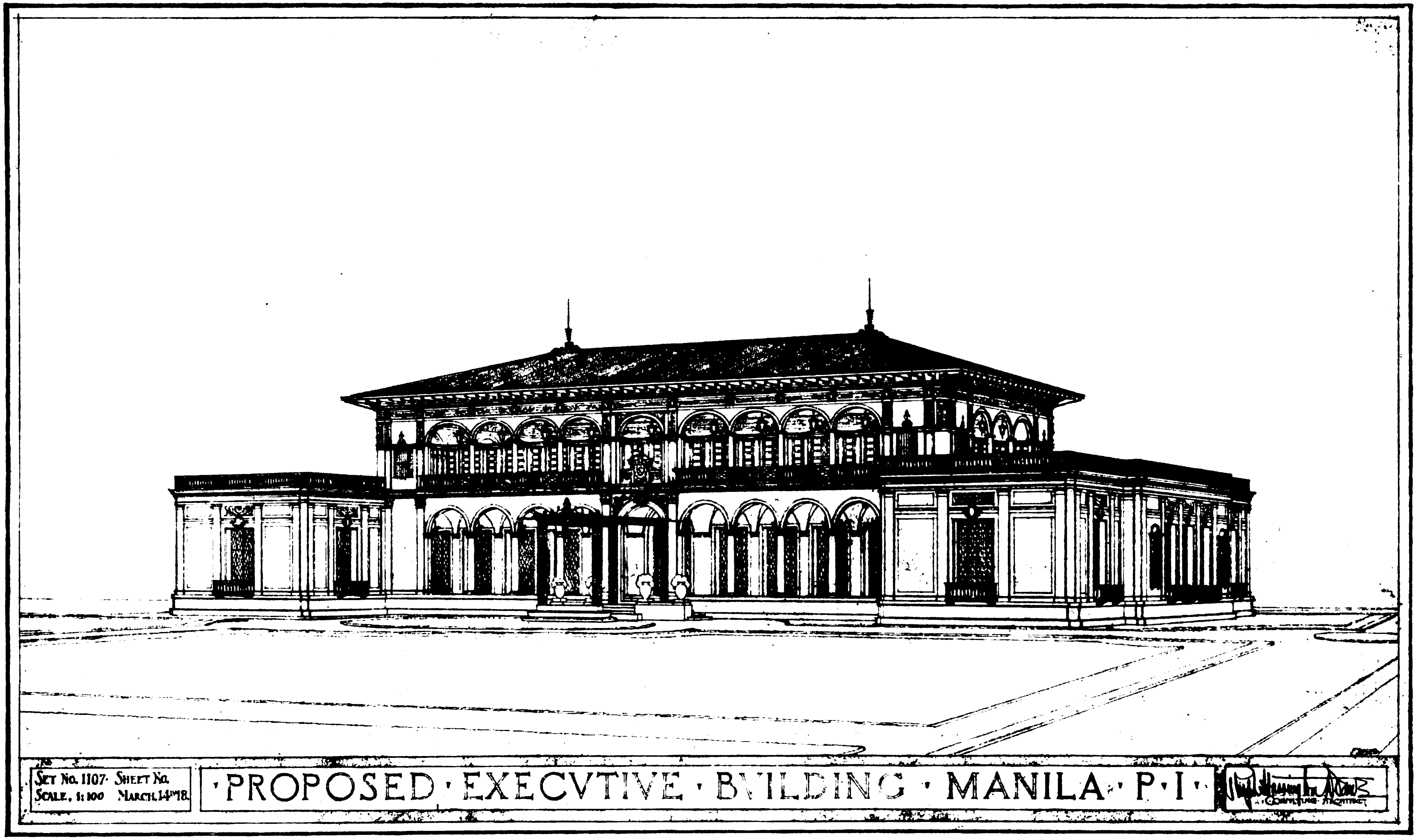
> KINDS OF LICENSES.
>
> *D. Foreman's license.*—Must be obtained by every foreman, etc., who purchases, or receives from his employer, explosives or listed ingredients, for sale or issuance to workmen under him. Application for these licenses must be submitted to the Provincial Commander of the province, or to the Chief of Constabulary if within the city of Manila, wherein it is desired to possess, use, or receive from his employer, explosives or ingredients of explosives, for sale or issue to workmen under him.

2. You are directed to apply immediately to the Provincial Commander of Constabulary in your district for the license in question, and upon receipt of same notify the Purchasing Agent through this office of the license number.

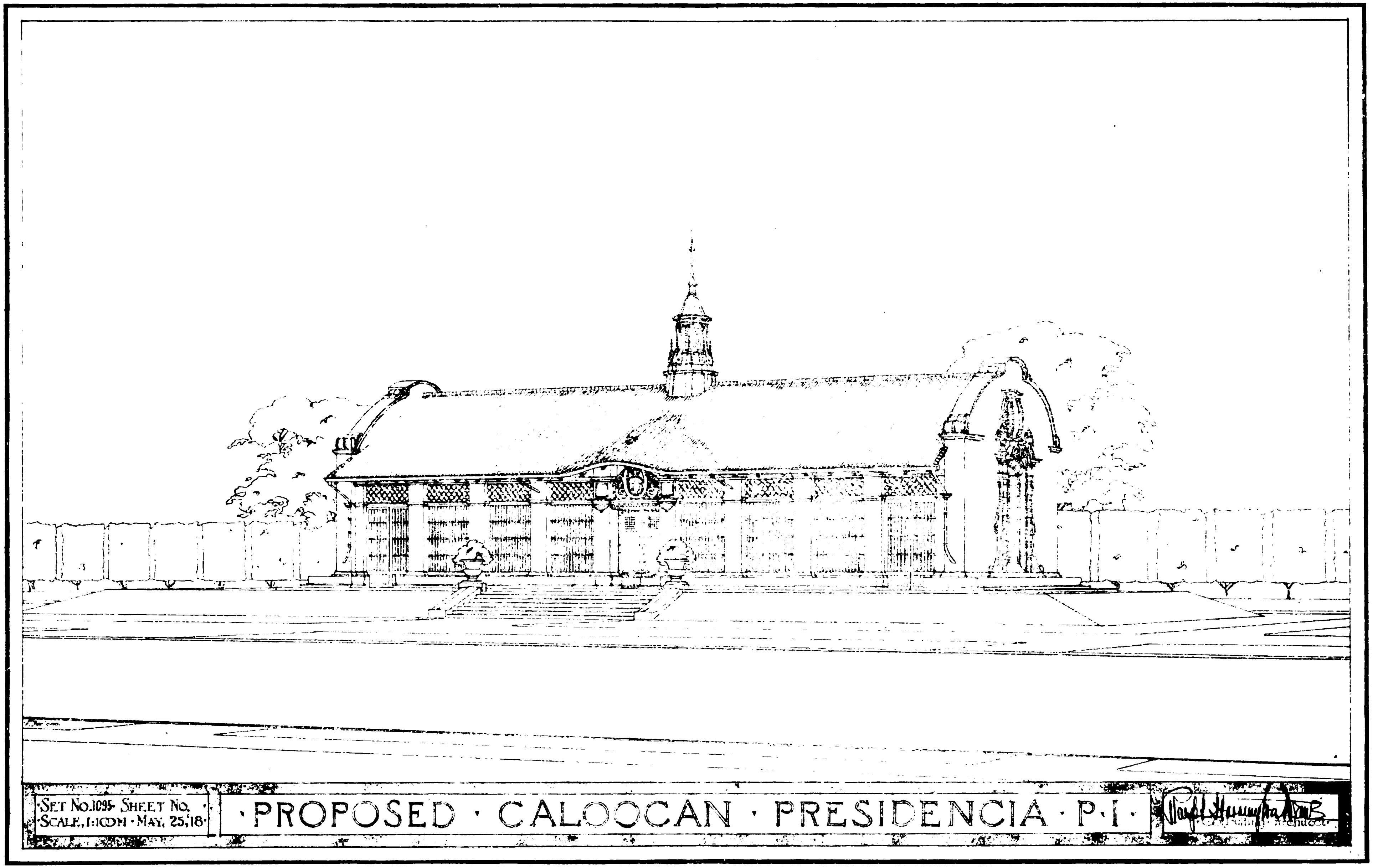
For the Director:

W. C. West,
Acting Chief Constructing Engineer.

To all District Engineers,
Mr. Jose del Castillo,
Mr. R. H. Treash, and
City Engineer, *Baguio.*


SET No. 1107· SHEET No.
SCALE, 1:100 MARCH 14TH 18.
·PROPOSED·EXECUTIVE·BUILDING·MANILA·P·I·
CONSULTING·ARCHITECT

Perspective, Malacañang Executive Building.


·SET NO.1095· SHEET NO.
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·PROPOSED · CALOOCAN · PRESIDENCIA · P·I·
Architect

Perspective, Caloocan Presidencia.

APPENDIX B.

PROJECTS ACTIVE APRIL 1, 1918.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	2	3																		1							1				2		1	10
Agusan	2	3			1																										1		3	10
Albay	3	4		1						1																							1	10
Ambos Camarines	2	8		1	1					1			1							7	1			1										23
Antique	5	2								1										1				2				1					1	13
Bataan	2	4					1													1				1				1			2			12
Batangas	8	10			2					2		2							1	10				8	4			6				2	24	79
Benguet	15	4											2											1	3	10		1	1				5	42
Bohol	11	6		2	10															10					2			6					2	49
Bukidnon	3	1							1																						1		1	7
Bulacan	2	3			1															2													2	10
Cagayan	2	2								1			1							1		1					1						7	16
Capiz	9	2			7															2							1						1	22
Cavite	2	2																		2													2	8
Cebu	8	2	1		1								1							1				2									2	18
Cotabato	6	2			3															4				1			1	1			2		10	29
Davao	6	2															1								2						2		8	22
Ilocos Norte	4	2							1											3			2			1							1	14
Ilocos Sur	7	3														1		1		6		1		2			1						3	25
Iloilo	12	5	3	1	1								1											3	1	3		3			1		5	39
Isabela	4	2							1				2							7													3	19
La Laguna	4	2						1												7				2										16
Lanao	2	2		3		1														3													4	15
La Union	5	4			1															7				3	1			1						22
Leyte	4	4			4				2		2		6							6		2		5	2						2		6	45
Mindoro	6	6		2	2					2										4	2				2			8					5	39
Misamis		3		1	5																1												1	11
Mountain Province	11	9			2								9	1						2	1	1		1		3	2	1					6	49
Nueva Ecija	6	2											1							3				1	1		1						10	25
Nueva Vizcaya	1	4		2																3		2											1	13
Occidental Negros	10	2		2	3								1											1			1						1	21
Oriental Negros	4	6			1					2			2							2								2			1		1	21
Pampanga	6	8			1			1												4				1			1							22
Pangasinan	10	3			3				1				1									3											1	22
Rizal	7	5			2															2						1							1	18
Samar	3	2																		2				1			1							9
Sorsogon	7	4						1									1			3		1		2	1			2					9	31
Sulu	3	2								1										5				2		4		2			1		2	22
Surigao	1	2																		2													1	6
Tarlac	8	3			2															1														14
Tayabas	6	3			1					1										1	1			1		2							4	20
Zambales	1	3			1															1													2	8
Zamboanga	5	4			1															1					2								4	17
Total	225	155	4	15	56	1	1	3	6	12	2	2	28	1		1	2	1	1	117	6	11	2	41	21	24	11	35	1		15	2	141	943

NOTE.—Of the 141 projects under the caption "Miscellaneous" are 9 surveys and investigation of roads, bridges, waterworks, etc., 4 wharves, 5 irrigation systems, 8 hospital buildings, 5 boundary monuments, 1 dredging project, 2 constabulary buildings, 5 docks, 3 irrigation ditches, 1 water tank, etc., 5 river control, 3 dykes, 3 portworks maintenance, 1 dam, etc.

BUREAU OF PUBLIC WORKS

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W. C. WEST, *Acting Chief Constructing Engineer*
C. E. GORDON, *Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer*

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L. T. Clark
J. C. Cookingham
C. S. Dandois
F. T. James
J. T. Marshall

Highway Engineer
W. C. West

Hydraulic Engineer
G. G. Stroebe

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Cheri Mandelbaum

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A. Toledo

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Juan Piedad

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Constancio San Jose

Cashier and Disbursing Officer
Teodoro Camu

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S. W. Hulse
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Saturnino Lopez
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Transitman
Ross Hagler

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M. Limlingan

Law Clerk
Eusebio Barba (acting)

Record Clerk
Primo Villar

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Jose Garrido
Pastor Gomez
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Rafael Ungson
Liborio Urtizberea
Gonzalo Vales
Rosario Villalon
Jose Wright

Junior Electrical Engineer
Vicente Villanueva

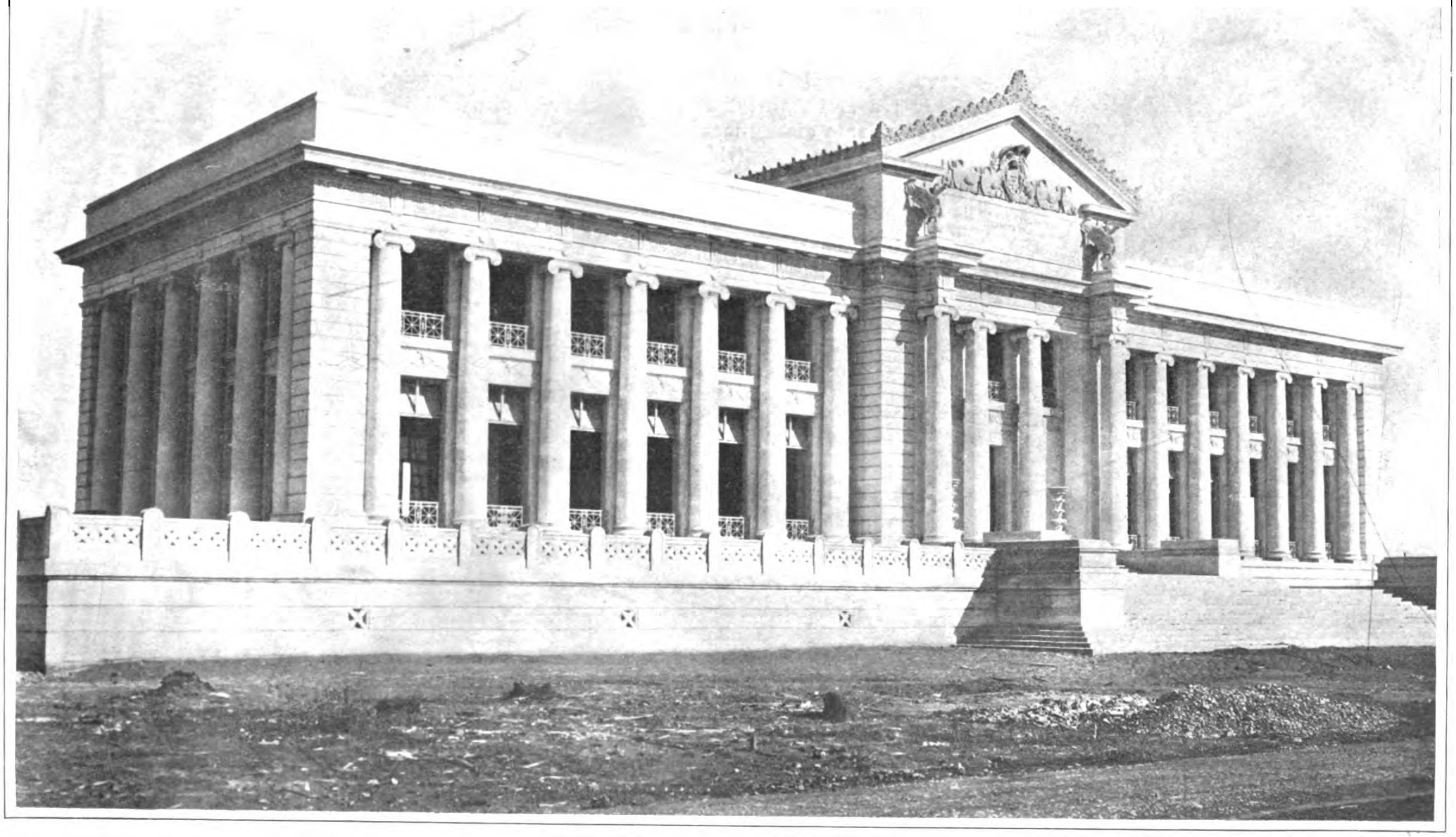
Junior Surveyor
Emilio Perez

BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS
PHILIPPINE ISLANDS

Quarterly Bulletin

VOL. 7 OCTOBER 1, 1918 NO. 3



Perspective view of the Pangasinan Capitol Building, Pangasinan.

162188

THE MANILA RAILROAD COMPANY.
OFFICE OF THE MANAGER.

MANILA, *September 26, 1918.*

GENTLEMEN:

I only regret that I cannot find words to express the measure of my appreciation for your service testimonial, which has just come to hand. The possession of this autographed resolution is treasured more than any other token that mortal hands could offer.

Because of the personal relations that existed betwen us, I hesitated for a long time to take my farewell from an organization whose employees had been so loyal to me. I felt, however, that the time had come when my services were no longer indispensable to the Bureau of Public Works. I therefore resigned to take over the greater responsibility of managing the Manila Railroad, closing a term of service with the Bureau of more than 15 years. During this period we have jointly sought to make the bureau an efficient government institution. The extent to which we have succeeded is not for us to say. I believe, however, that the entire Filipino public has at one time or another voiced its satisfaction in some form hence we have no apology to offer.

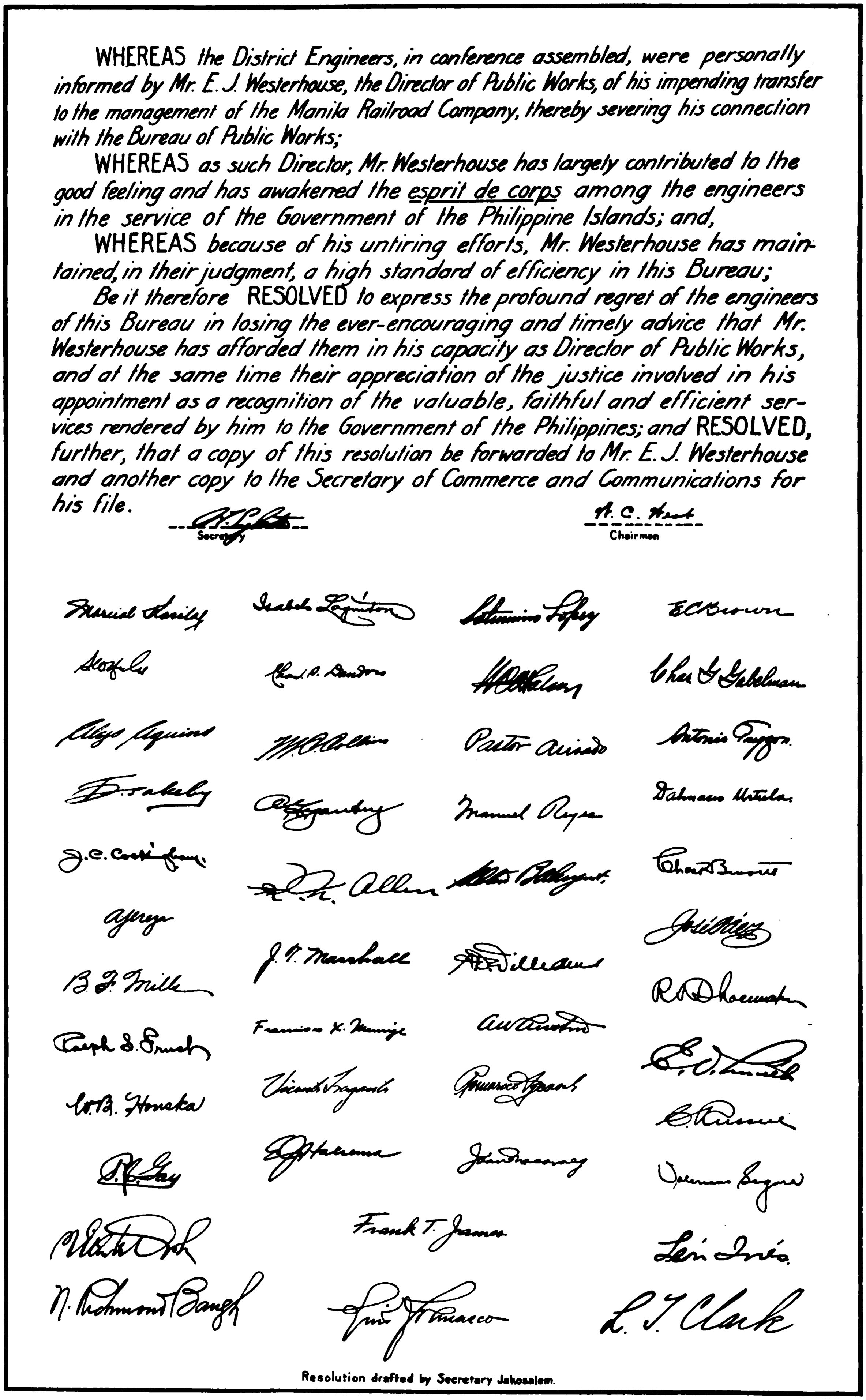
The daily contact with all of you has inspired me with a greater love for humanity; a realization that character, principles and the higher ideals predominate among men.

I shall intently watch each individual career and rejoice with my former associates as each step brings them nearer the goal of their ambitions.

Very truly yours,

E. J. WESTERHOUSE.

To the MEMBERS OF THE 1918 CONFERENCE.



WHEREAS the District Engineers, in conference assembled, were personally informed by Mr. E. J. Westerhouse, the Director of Public Works, of his impending transfer to the management of the Manila Railroad Company, thereby severing his connection with the Bureau of Public Works;

WHEREAS as such Director, Mr. Westerhouse has largely contributed to the good feeling and has awakened the esprit de corps among the engineers in the service of the Government of the Philippine Islands; and,

WHEREAS because of his untiring efforts, Mr. Westerhouse has maintained, in their judgment, a high standard of efficiency in this Bureau;

Be it therefore RESOLVED to express the profound regret of the engineers of this Bureau in losing the ever-encouraging and timely advice that Mr. Westerhouse has afforded them in his capacity as Director of Public Works, and at the same time their appreciation of the justice involved in his appointment as a recognition of the valuable, faithful and efficient services rendered by him to the Government of the Philippines; and RESOLVED, further, that a copy of this resolution be forwarded to Mr. E. J. Westerhouse and another copy to the Secretary of Commerce and Communications for his file.

Secretary

A. C. Hext
Chairman

E C Brown
Chas G Gabelman
Pastor Arinado
Manuel Reyes
Dalmacio Urtula
J. C. Cunningham
J. T. Marshall
B. F. Miller
Francisco X. Munoz
Ralph S. Frush
Vicente Fragante
W. B. Honska
Frank T. James
L. T. Clark

Resolution drafted by Secretary Jakosalem.

QUARTERLY BULLETIN

BUREAU OF PUBLIC WORKS
MANILA, P. I.

ISSUED QUARTERLY UNDER THE DIRECTION OF
THE DIRECTOR OF PUBLIC WORKS

A. T. SYLVESTER, COMPILER

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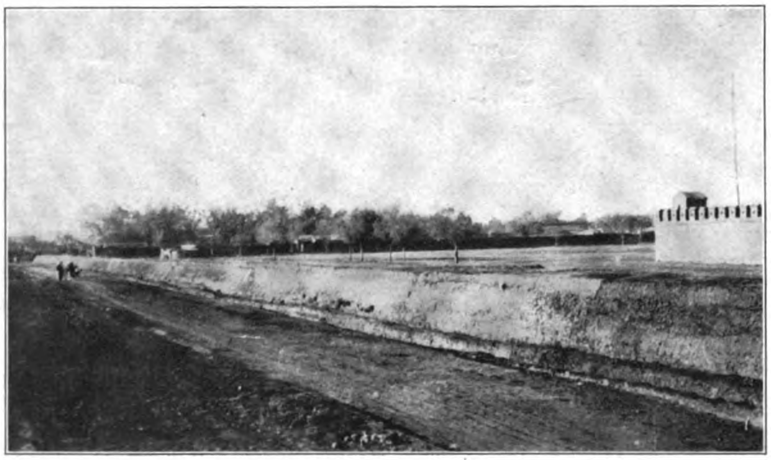
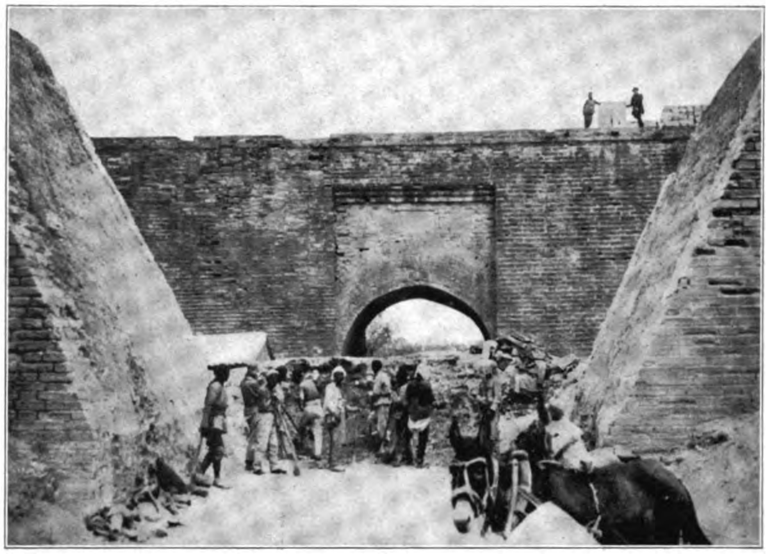
AN ANCIENT HIGHWAY OF CHINA.

In April and May, the writer enjoyed a vacation in northern China, and during that time had an exceptional opportunity of penetrating into some sections of that country that are well off the usual route of tourists. He found many evidences of an intelligent and industrious past, much in decay, but several unmistakable signs of slow but sure economic and social awakening.



Site of the imperial granaries at Tungchow. A corner of the Chinese cantonment shows upon the right.

Transportation was well provided at one time and history records that Emperor Shi Hwang-ti of the *Ts'in* dynasty reigning about 215 B. C., and who also began the construction of the Great Wall, built many roads and canals; but the old transportation routes had deteriorated so greatly that until about 20 years ago only ruins of what once obtained remained. At that time the inauguration of railroad construction was undertaken and since several hundred miles have been constructed, beautiful administration buildings erected, and in some places suitable and imposing railway stations developed. Many additional miles of railroad have been projected, surveyed and located, and when peace is finally restored it is believed the consummation of the plans will be effected, as it is assumed that funds from the United States will be available to finance the construction.



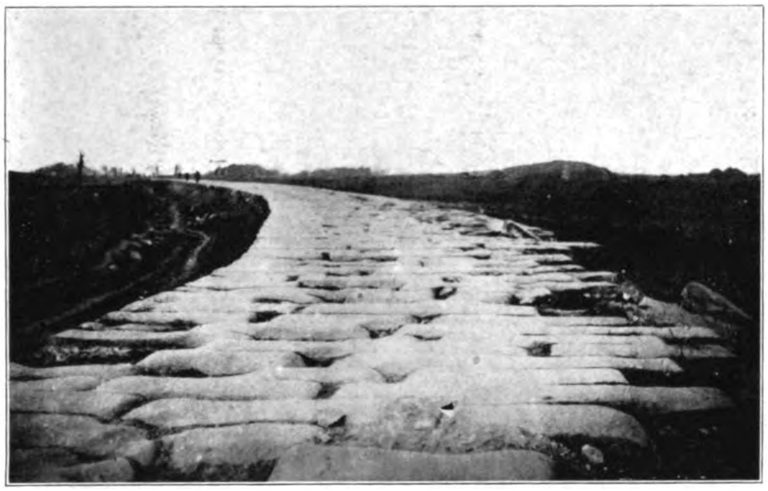
Widening out the walls of Tungchow. All cities in China are surrounded by these ancient structures.

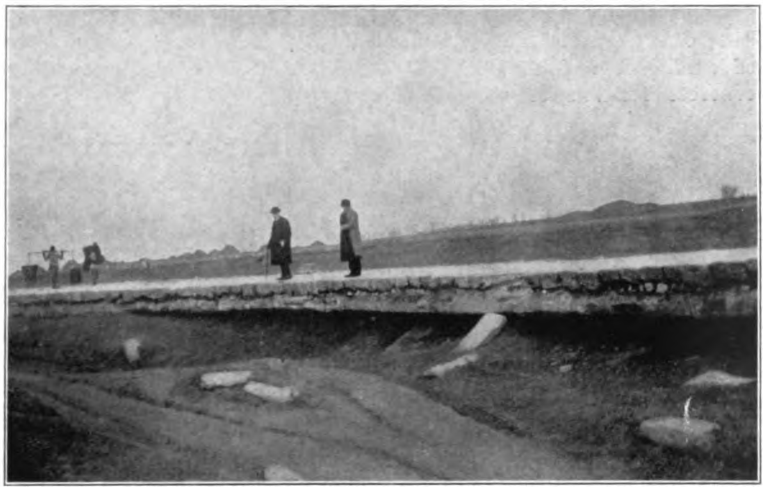
The increased facility of transportation effected by the railroads has irrefutably indicated to the Chinese people the economic necessity of restoring the other and ancient transportation routes. The grand Canal along which Marco Polo claims to have passed, stretches from Tientsin on the north to Hang-chow-Fu on the south for a distance of about 1,200 miles. The aforementioned length is assumed from the itineraries published by Pére Gandar in which the total length of the canal is given as 3,600 li., which is about 1,200 miles. This is one of the greatest canals constructed by man and passes through a country ideal for agriculture, several hundred miles thereof being across the silt plains created by the advancing delta made by the annual overflows of the famous Yellow River. Because of the general decay, it, in places had deteriorated greatly until its value as a tranportation medium had become greatly impaired. It is a pleasure to state that American engineers, one of whom is a former Director of this Bureau, are now engaged upon surveys for its improvement and possible restoration to its ancient importance. Also, a beginning under American advisement has been made in the development of the ancient highways.

A one-wheeled cart—the usual freight vehiole. Chief Engineer Kyle standing at the right.

It was a very rare privilege which the writer enjoyed when he was invited by Mr. George Kyle, chief engineer, of the American International Corporation, for a trip over the Tungchow-Peking section of the ancient Tientsin-Peking imperial highway. This road is 87 miles.

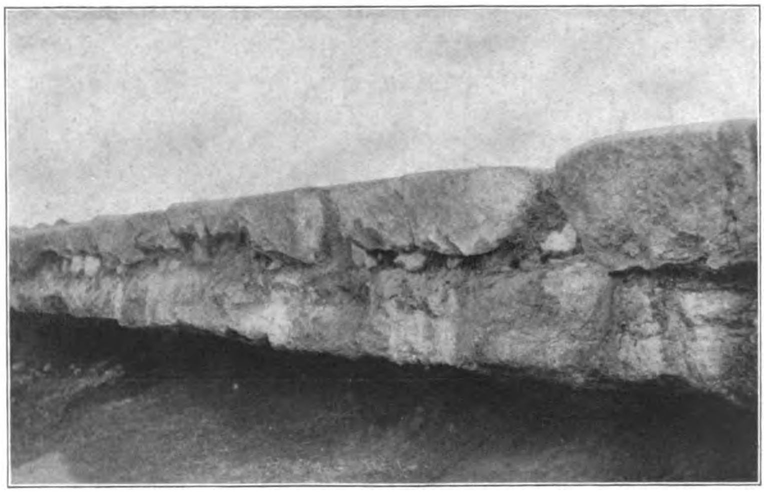
long and the above named section was undergoing reconstruction, and extended from Tungchow to Peking. The first construction of the road occurred during the dim past and its great age is clearly indicated by the very wide depression caused by centuries of erosion. Due to the elements and traffic, the depression has become so wide as to appear more like a gentle and natural undulation between two hills than caused by a road. Certain monuments by its side indicate when it was last reconstructed, which was during the Manchu dynasty and about 157 years ago. The road was built principally and chiefly as an avenue of transportation. The imperial family resided at Peking; it was a great city; and a vast country and an enormous population to the south annually paid tribute to the imperial city and the reigning family. An idea of the extensiveness of the empire during the reign in which the road was reconstructed may be obtained from the facts that this emperor added eastern Turkestan to the empire; twice he invaded Burma; once he penetrated into Cochin-China; and his generals marched an army into Nepal to within 60 miles of the British frontiers of India and received the submission of the Nepalese. The principal form of the tribute was in the furnishing of grain. Great fleets of junks were loaded upon the rivers and in the ports of the southern empire, and great cumulative loads were carried across the country upon the highways, all to be eventually moved to the Grand Canal, and thence over its placid and safe waters to Tungchow where the loads were taken by waiting hundreds of laborers to the imperial granaries. These granaries still existed in 1900 and the writer was informed, were well supplied when the Allies advanced upon Peking during the Boxer troubles of that time. Then the granaries were destroyed, and now only a little prairie with a Chinese cantonment thereon is found on the site. The grain was then transported the remaining 14 miles to additional imperial granaries within the walls of Peking. These latter buildings are standing today as mute reminders of a food tribute of a despotic past. After the establishment of a road, a canal was constructed which parallels, generally, the road.


The road as it appeared before reconstruction. Note the easy curve and grade.

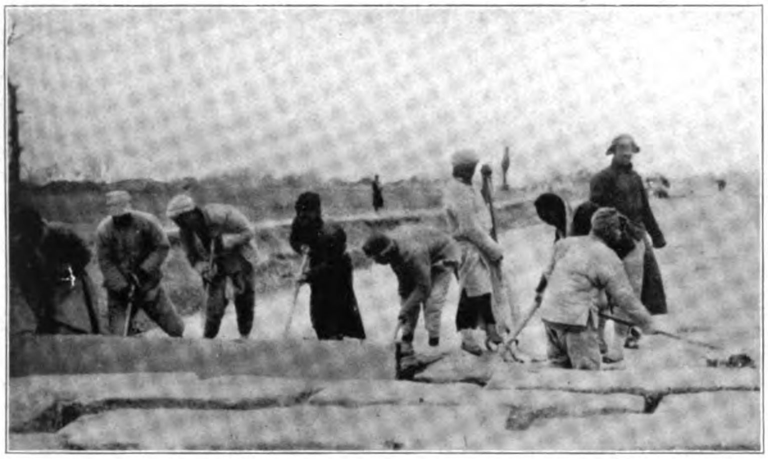

A view showing the great deterioration of the road. Note how the shoulder has been completely destroyed.

Until the writer examined the construction of this road it was his impression that the Romans were the only great people of the past who built so solidly and for a long future. He was greatly surprised, and as he passed over mile after mile and noted from whence the material was procured, his admiration for the builders became great. In some respects this road was superior to the Roman roads. In alignment, slope, grade and width it would meet the most exacting requirements of the present day. The curves appeared to be regular, were of small degree, the location fitted the country perfectly, hills were passed upon a contour instead of passing over as the Romans would have done, at an expense of an increased grade, and the width would permit auto traffic to pass at high speed without any danger of collisions. The imagination of the writer pictured how this road must have appeared when new, with its great granite blocks, cut so that but small and almost undiscernible joints could be seen, all set like brick upon a base of lime concrete of a thickness of nearly 1½ feet. Great must have been the imperial pleasure of K'ien-lung upon this material achievement even if it did cost several thousand ounces of gold, as an inscription upon a marble monument by the roadside indicates.

A view showing a portion of the paralleling canal and the torn up road. Note how well the road location fits the country.

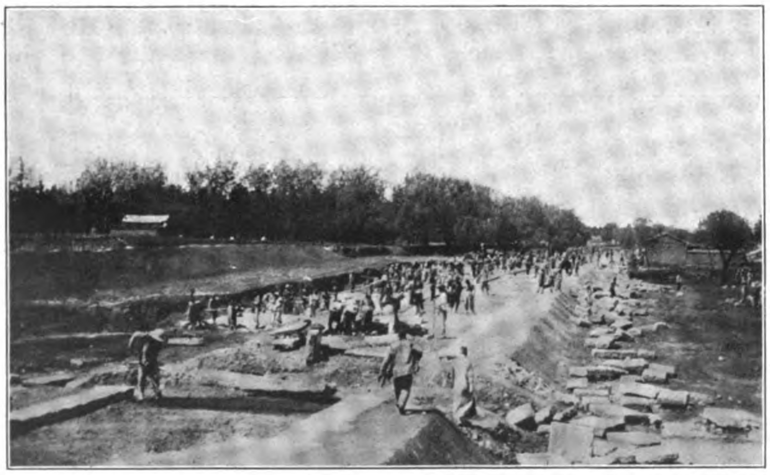

A close view showing the massiveness of the construction. The lower stratum is lime concrete. The upper is granite blocks.

The paved way was 21 feet wide. The foundation consisted of lime concrete varying in thickness from 14 inches to 16 inches. The paving blocks were laid transversely to the road and were from 8 feet to 10 feet in length, 2½ feet wide and from 12 inches to 14 inches in thickness. All appeared to have been built upon a small embankment in order to procure the best drainage possible and thus eliminate the possibility of heaving due to the frost in winter. The writer found evidences of an earth shoulder, but because of the erosion of time, he could only presume that originally shoulders had been constructed of suitable proportions, and upon the same degree of excellence and completeness as appeared from the granite and concrete remains of the paved roadway.

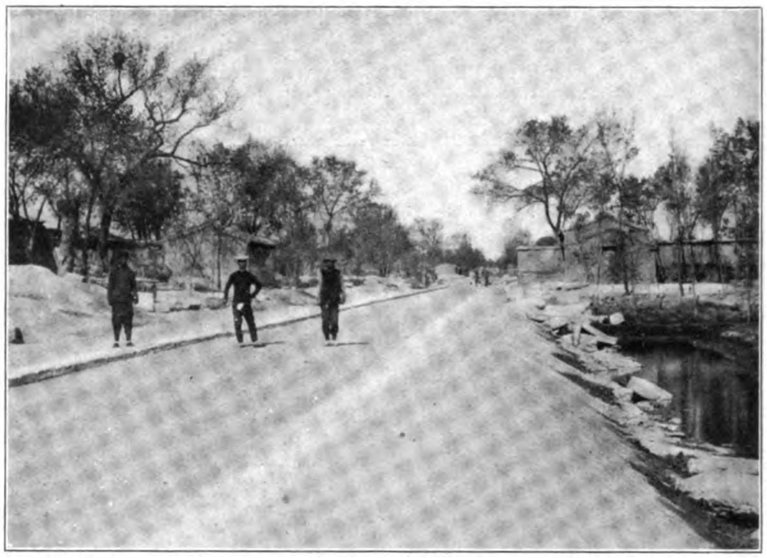


Chinese laborers removing the blocks. Note that five men are engaged in turning over one block.

But time must move and improve. This ancient transportation masterpiece of the ancient dynasty has been radically changed. Modern engineering looks with disfavor upon such blocks of stone; their use is not efficient; they are unnecessary; they are cumbrous; they are difficult to maintain, and therefore the great blocks of granite which the minions of a bygone dynasty drew and pulled across the Chih-li prairies from the mountains southwest of Peking for the imperial foot, have been smashed and broken into small fragments to be used in the modern way upon a modern road. The excellent concrete foundation has been retained and the best slabs have been dressed and righted so as to serve a double use,—shoulders for the macadam and wheel ways for the omnipresent wheelbarrow which is in general use throughout China. The writer had the opportunity of suggesting a double wheel way upon each shoulder for these barrows and it is understood that the suggestion was adopted. This will permit the barrows to move upon each shoulder—one way for outgoing barrows and the other way for incoming barrows. He became greatly impressed with the necessity of providing amply for this vehicle after having observed the provisions made in Kiaochau by the Germans, and the use that was being made by the Chinese of these stone ways. However, it is proper to state that, so far as the writer has observed, in the country about Tsingtao, the Germans provided but one granite way for barrows.



Reconstruction under way.



Reconstruction completed to the placing of the macadam between the shoulders shown.

Like ancient Rome along the Via Appia many white marble monuments were visible but in the form of triple pailow and vertical massive marble columns upon marble tortoises of great size. Instead of the Roman tomb the cypress grove shading the Confucian burial mound abounded.

One of the numerous white marble monuments to be seen by the roadside. Note the cemetery grove in the background.

To know a people their works must be known. As the writer returned from his trip over this road masterpiece, as he recalled the enormous marble pailow and other marble monuments by its side, he felt at least he had a glimpse into the past of a mighty people. Not mighty in themselves, in the mass, but mighty in the leadership, in the despotism. Only such works were possible from a combination of imperial will and deeply subjective humanity. The mind of the despot and the labor of inconsequential thousands for decades made the pyramids of Egypt possible. Deduction, education and individualism, and the enlightenment of the masses, makes the achievements of the despots of the past easy. K'ien-lung willed that large blocks of granite should be transported for many miles across the prairies of Chih-li for his road; the modern engineer achieves the same results with small 2½ inch stone. King Khufu (or Cheops) built his pyramid from the granite of the falls of the Nile, but the engineers built a great hill at Panama to impound the waters of Gatun. Then, despotic will and mass benightedness achieved; now, applied science and mass enlightenment achieves. Despotism is passing; liberty is gaining. It is well.

A marble monument stating that the road was built "in the 26th year of K'ieng-lung" and for the "benefit of the people."

PANGASINAN CAPITOL BUILDING.

By Sotero Baluyut.

AIM.

About the year 1886 during the Spanish régime a mixed building, of wood and adobe, with iron roofing was built to house the then provincial government. This building is located in the heart of Lingayen.

Since that time the Government has changed and this Spanish designed building has become too small for adequately housing the new provincial government under American sovereignty. In 1911 a committee composed of the provincial board and the district engineer decided to plan for the erection of a new provincial center as soon as sufficient funds were available.

PLANS.

The proposed center is probably the most elaborate yet planned, and calls for a capitol, court house, executive building, jail, garage, hospital, and residences for the provincial governor and the provincial treasurer. All the buildings are to be constructed of reinforced concrete, at a cost to the province of about a million pesos.

In view of the limited amount of money obtainable for expenditure it was decided to build the capitol first. A tract of land containing 25 hectares bordering on the gulf of Lingayen and affording a magnificent view was obtained in the municipality of Lingayen, and on April 21st, 1917, a representative body of people of this province assembled at the beach to celebrate the laying of the corner stone of the new provincial building, the plans of which, designed by Mr. Ralph Harrington Doane, Consulting Architect, were accepted and approved by the provincial board. This was the first real tangible act toward the consummation of more than 6 years of labor. Excavation was started on July 2d, 1917, and the construction of the capitol building was completed in about 18 months.

APPROPRIATIONS AND COSTS.

To make possible the construction of this edifice—the largest and most elaborate ever undertaken by any province in the Philippines—the sum of ₱360,000 was appropriated, ₱265,000 of which was loaned by the Insular Government. Of the amount expended in this building ₱108,285.03 were spent for labor, representing 30 per cent of the total cost. Due to war conditions the cost of the building has proportionately exceeded the original estimate.

It may be of interest to note that only first class materials were employed in the erection of this building as can be seen from the following list:

Cement	barrels	8,104
Steel	kilos	1,091,122
Crushed stone	cubic meters	4,830
Gravel	do	750
Sand	do	1,636
White limestone	do	239
Form lumber, Redwood, Lauan, Apitong and Lumbayao	board feet	214,584
Narra, Yacal and Molave	do	108,181

ORGANIZATION.

Rapidity in the construction of a building of this kind necessitated the employment of a big force of skilled and non-skilled laborers, including technical men. One Filipino assistant engineer was employed for the technical parts of the work and an American foreman to direct the construction. The force of men handled by the foreman in charge was subdivided into groups under Filipino foremen. Practically all the men were Filipinos, with the exception of 2 Japanese carpenters. There were 145 Filipino carpenters and one Spanish mason for the stucco finish. The Spaniard stayed only about two weeks to start this work, which was continued by Filipino skilled masons who readily learned to do this kind of work.

The construction force employed can be appreciated by the list below:

1 Filipino assistant engineer.
1 American foreman.
1 chief carpenter on plans and details.
145 carpenters.
1 foreman of masons.
53 masons.
1 blacksmith capataz.
6 blacksmiths.
1 concrete foreman.
48 concrete men.
3 plumbers.
1 capataz on stucco finish.
15 masons.
1 clerk and 1 timekeeper.
3 engineers (steam).
3 firemen.
5 miscellaneous employees.
1 foreman on transportation.
15 laborers.

PLANT AND EQUIPMENT.

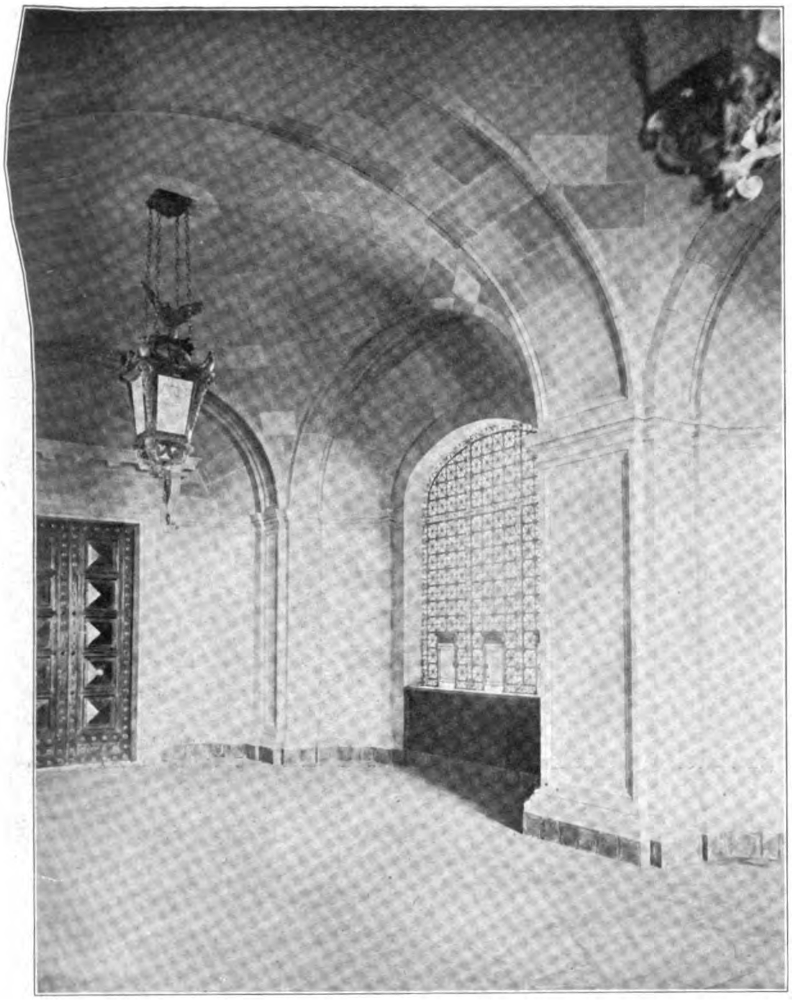
The difficulties encountered in the transportation of materials from Dagupan to Lingayen, 13 kilometers distant, were met by the employment of 2 road rollers with 26 wagons. In addition 30 bull carts were employed for transporting materials about the building and 4 wooden scows were used in transporting crushed rock from the quarry at Labrador to Lingayen, about the same distance as Dagupan. A concrete mixer with elevator was erected to properly handle the distribution of the concrete.

SPECIAL FEATURES.

In the erection of the 8.5 meters high hollow concrete columns, concrete moulds divided into several sections were employed. A total of 48 of these columns were constructed.

Seven ornamental lamps of carved wood, iron, and concha shells, demonstrative of Filipino skill in wood carving, adorn the main lobby, main hallways and staircase and the session hall of the provincial board. To properly light the building, 112 denzar lights are distributed throughout the building, besides small electric lights installed in minor places. The chipping of the outer surface of concrete has produced the appearance of natural stone.

The capitol building, elevated on a terrace, commands on one front a vista down a wide and imposing boulevard to the municipality, on the other front a seascape broken only by the rugged outlines of Mount Santo Tomas on the east and the wooded highlands of the Zambales mountains and Cape Bolinao on the west. The grounds are of sufficient extent and contour to furnish ample op-



First floor of Pangasinan Capitol Building, showing grills and lamp, Pangasinan.

portunity for extensive parking, which will add greatly to the present natural beauty of the site. This building, itself the central one of a group to be erected in the future, as necessity demands and funds are available, is fifty-five meters long by eighteen and four-tenths meters wide, constructed of reinforced concrete with a stucco finish to imitate limestone, and stands on a balustrated terrace. The terrace is so arranged, on the north and south, as to allow the use of the basement for an immense storeroom, which gives it the appearance of an additional story. The basement is lighted and ventilated by areas protected by wrought iron grills.

The exterior walls of the edifice are designed in a series of similar columns with maximum window openings which are protected from the elements by the deep recesses of the colonnade and the overhanging cornice. The ornaments used to enrich the appearance are only such as are strictly in accordance with the classic architectural features of the structure. The concrete specialities for the ornamentation were manufactured in Manila and shipped to the site as needed.

Windows throughout the structure are of concha shell with narra frames, protected by wrought iron grills. A crystalline limestone, recently found in unlimited quantities near Alaminos and which resembles the beautiful Italian marble Botticcino, was used in the exterior finish, producing a warm bright color in harmony with its tropical setting. This is a marked improvement over the dull, dead, gray so characteristic of the previously constructed concrete buildings throughout the islands.

In planning this building, the most important factor taken into consideration was to supply ample, attractive, well lighted, and ventilated offices for the various officials. This was obtained first by the large window openings and by designing the interior in large open spaces, interior walls being omitted so far as possible. This gives the building the appearance of a large open pavilion.

Facade of the Pangasinan Capitol Building, Pangasinan.

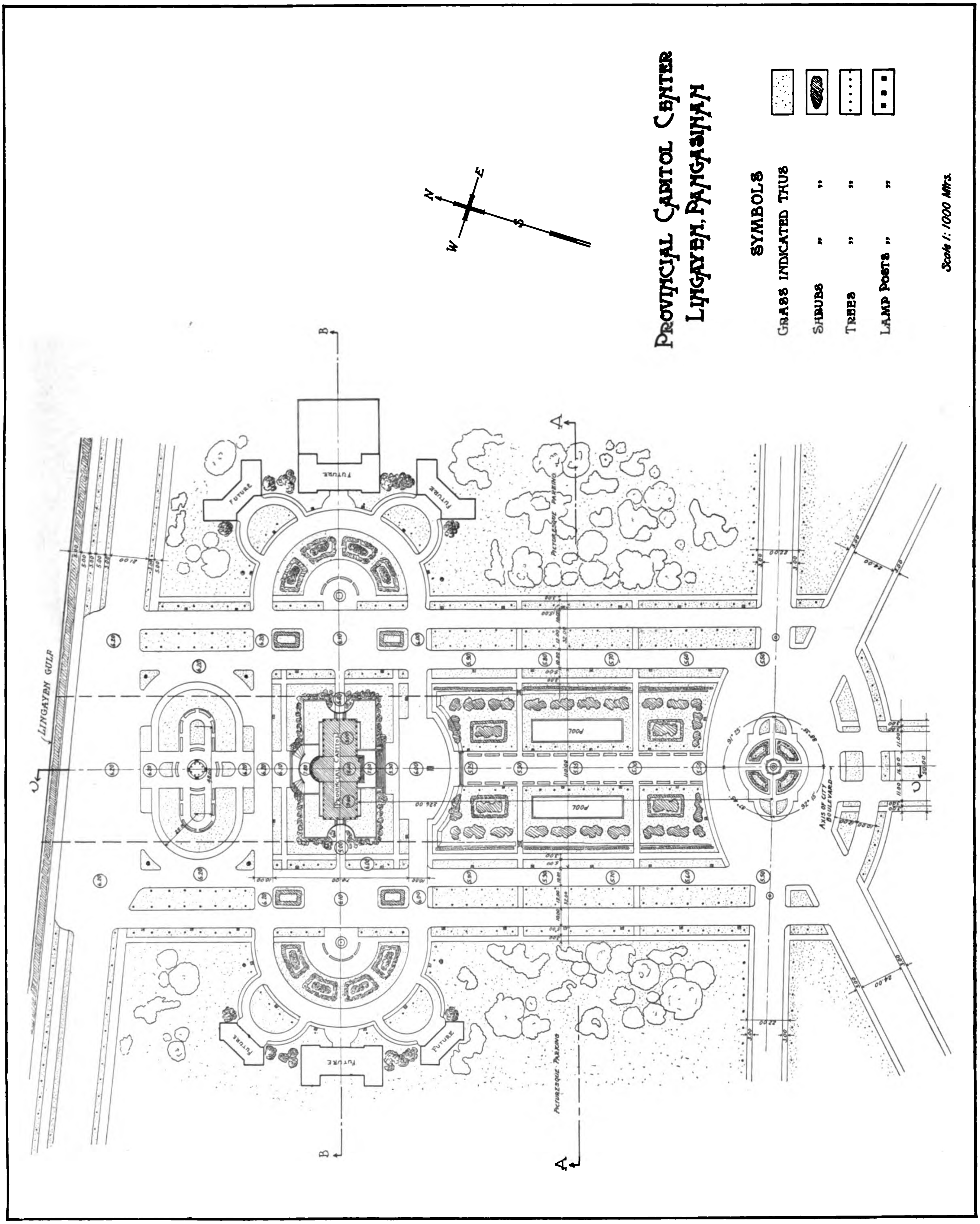
The lobby on the first floor, the stair hall, the court room on the second floor with its balcony, as regards architectural effect, produce an interior suitable to the dignity of the province and surpassing in grandeur and beauty anything yet obtained in provincial capitol buildings.

Reference to the plans shows that the arrangement of offices is as simple and convenient as possible. The first floor on account of the large number of transactions each day with the general public, is occupied by the offices of the provincial treasurer, the district auditor, the district engineer and the provincial assessor. The second floor is occupied by the court, the governor, the district health officer, and the superintendent of schools.

The beauty of the design and the completeness and convenience of its arrangements have created wide spread enthusiasm and interest among the people.

The charm and beauty of this building is due to a large extent to its good proportions, good materials and well studied details. As the characteristic traits of the people are formed by their surroundings, this beautiful building, the attractive grounds and the broad boulevard will have an effect on the present and future generations in reaching their desired attainments.

Pangasinan Province has an area of 620,000 hectares, a population of 550,000 people, and an estimated income of ₱600,000 per year. During the past 15 years, the total expenditures for road construction exceeded ₱1,120,000 as a result of which there now exist 271 kilometers of first class road with an equal kilometerage of second class roads, all properly maintained. Bridge construction during the same period amounts to ₱1,233,000 and public buildings, to ₱830,000.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LINGAYEN, PANGASINAN
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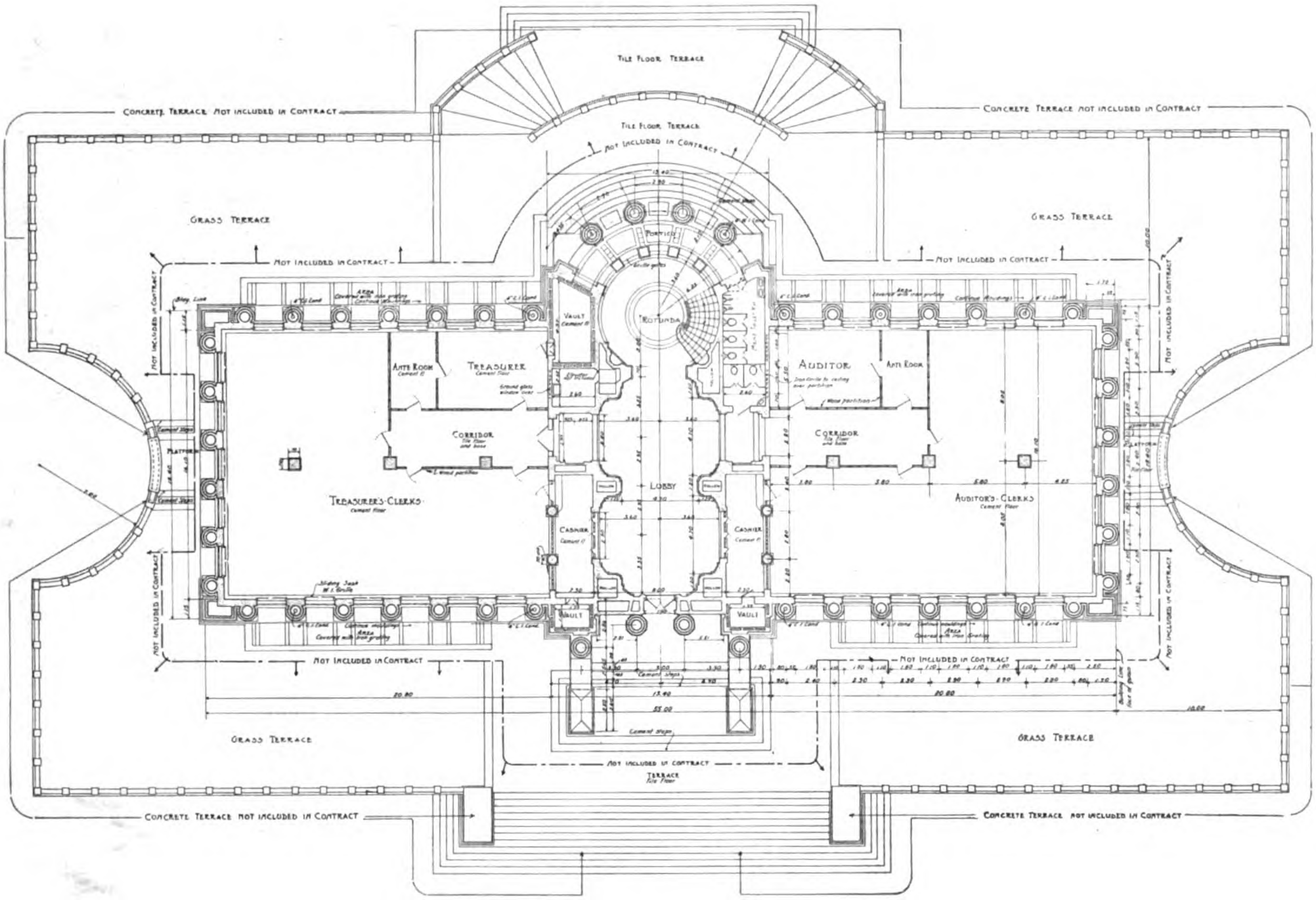
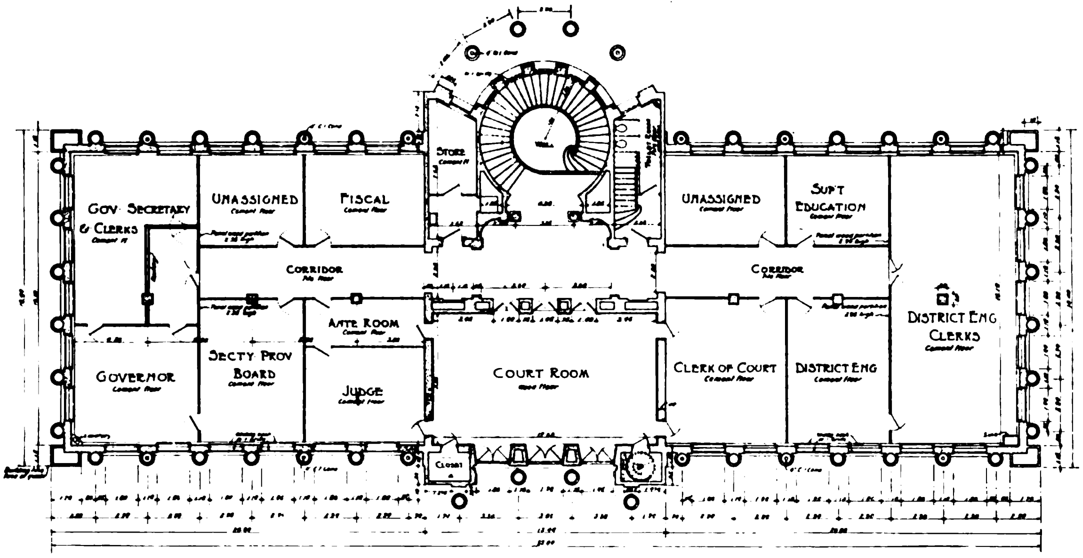
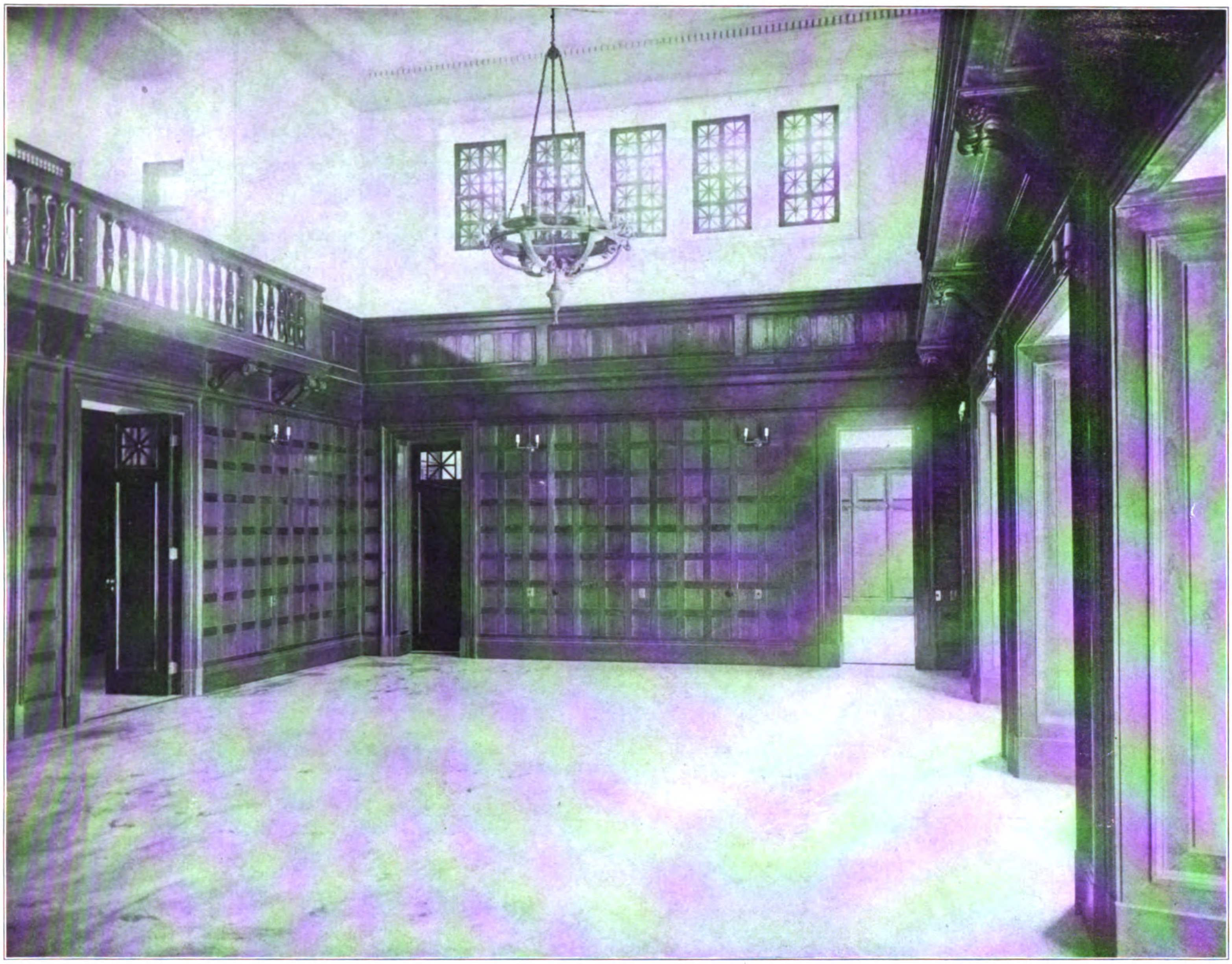


·1ST· FLOOR PLAN

FLOOR PLANS
CAPITOL BUILDING
LINGAYEN, PANGASINAN



2ND· FLOOR PLAN



Assembly Hall of the Pangasinan Capitol Building, Pangasinan.

ON THE JOB HERE AND THERE.

Capt. Claud Russell, Director of Public Works, has been summoned to take the first available transport to report at Fort Lee, Virginia for military training.

First Lieut. L. T. Clark, supervising engineer stationed in Cebu, has been called for military service. First Lieut. C. G. Gabelman, district engineer of Sulu has been ordered also to proceed to the States by the first available transport for military service.

Mr. F. X. Memije, formerly district engineer of Pampanga, is now a locating engineer for the Manila Railroad Company.

Second Lieut. Jacinto Gochoco, an engineer of the Bureau, is now in the National Guard.

The Bureau Service Flag now has 51 stars.

PROJECT NOTES BY DISTRICT ENGINEERS.

ABRA.—A survey has been made for a water system for the municipality of Bangued and report of same has been forwarded to the Director of Public Works for his approval.

Work on the Bangued–Tangadan Road is progressing nicely. All subgrade work on the side which corresponds to the Province of Abra has been completed, and gravel is being placed. Work on the side which corresponds to the Province of Ilocos Sur has been put underway and at the present writing there are four hundred men employed. It is expected that by Christmas all subgrade work will be finished on the entire road.

AMBURAYAN SUB-PROVINCE.—Work on the Sevilla–Tagudin Road has been started, work being done by the paquiao system.

AGUSAN.—The construction of the telephone line from Nato to Talacogon, a distance of about 30 kilometers, is now completed. This line will bring the four municipal districts of Sta. Fé, Guadalupe, Sta. Ines and San Luis and the municipality of Talacogon in close touch with Butuan. The telephone line at present passes through woods and bushes so that fallen trunks or branches have always caused interruption of the line. To avoid this and to lessen the difficulty for inspection a 3-meter trail, which at the same time serves as a means of communication from barrio to barrio, is now under construction.

During the last three months 4 kilometers of subgrade have been completed on the Butuan–Cabadbaran Road. The work is done by contract and is progressing very satisfactorily. About 2 kilometers more of subgrade and approximately 12 bridges will have to be constructed before the road can be opened for traffic. Difficulty is now being experienced in obtaining lumber as there are very few local contractors who will supply same at a reasonable price.

The construction of Butuan Hospital is progressing rather slowly for lack of carpenters and also due to slow delivery of lumber by the contractors.

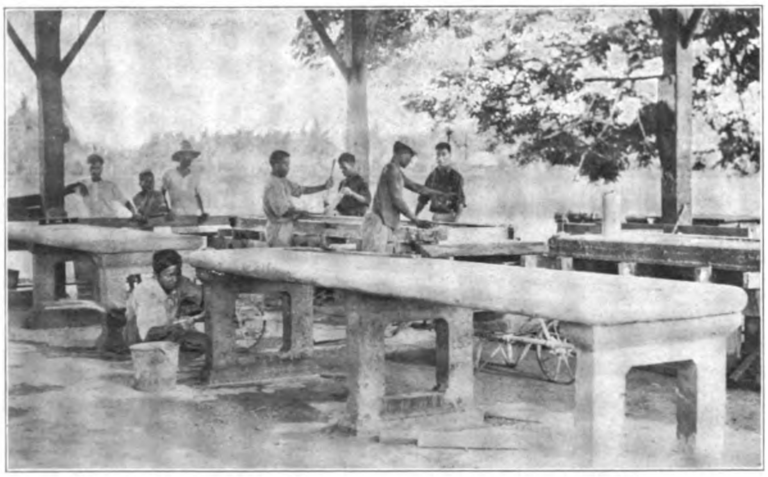
Casting Floor Slabs, Butuan Hospital.

The construction of Butuan–Nasipit Trail has been started but work is progressing rather slowly for lack of laborers.

Arrangement is now being made to transfer the Magallanes monument at Magallanes to a safer location within said barrio. The place where the monument now stands is being rapidly undermined by the sea, and considerable damage has already been done to its foundation.

The dry season has greatly helped the cleaning of the Upper Agusan Channels. Many trunks which were unnoticed before have been discovered and taken out.

The amount of ₱2,500 has been appropriated for the improvement of streets in Butuan. Work has already been started.



Construction Butuan Market Tables.

ALBAY.—Grading has been started on the Albay–Sorsogon Road. An Insular allotment of ₱50,000 has been made to begin this work. An administration force of about 250 men is at work and, as far as possible, the work has been done by paquiao, a unit price of 50 to 60 centavos for dirt being paid. Up to the beginning of September about 4 kilometers of grading had been finished.

Resurfacing of the Legaspi–Albay section of the Legaspi–Naga Road has been discontinued owing to lack of funds and shortage of carts. One kilometer has been resurfaced with Camalig stone and is holding the heavy traffic satisfactorily.

Materials have been received for the Daraga market and it is hoped to finish this project in the next quarter.

During the heavy rains of August the Guinobatan–Jovellar–Road became impassable to automobiles. On the construction of kilometers 8 to 13 a soft limestone rock was used, which was spread not over six inches in thickness. This section is less than 2 years old, and is already impassable in rainy weather, showing again the folly of light surfacing under present traffic.

The back-road from Legaspi to Daraga via Cogon is now nearly completed. Base course has been placed on the entire section and rolled, and top course has been spread and rolled on about two kilometers. This road should be finished during the coming quarter.

Grading has been finished on the Polangui–Libon Road but no surfacing has been spread, there being no road roller available at present, as the Aveling & Porter roller has been laid up since June with a broken cylinder head.

Labor conditions are improving throughout the province due to the reduced price of hemp, but it is still quite difficult to get skilled workmen, such as carpenters and masons, at the wages which the Government pays.

AMBOS CAMARINES.—Preliminary investigations of small irrigation systems for the towns of Daet and Bula have been made. Some 1,200 hectares in the town of Bula will be irrigated and about 2,000 hectares in Daet would be greatly benefited by an adequate system of irrigation.

Kilometers 1 and 2 of the Naga–Boundary Road have been resurfaced. It is expected that, by the end of the year, this road will be in condition to endure the heavy camion traffic to which it is subjected.

The construction of the Talisay–Labo Road was commenced on September 2. This is an important road the necessity of which has been keenly felt for a long time. It will provide an outlet for the rich, agricultural Labo region.

Resurfacing of the Mercedes–Daet Road has been completed and the road is now in excellent condition.

Work on the Pili–Tigaon Road has been suspended temporarily owing to lack of funds. The construction gang has reached as far as Panagan River, kilometer 38. From this place to Tigaon, kilometer 44, the road is easily passable to wheeled traffic during the dry season.

The most important road project of the province at present is the Naga–Pasacao Road. Work was started in June and so far about one kilometer and a half has been graded at a high cost, owing to the necessity of building a high embankment across the frequently flooded and marshy lowlands of Milaor.

The Naga Market Tienda has been completed and all the rooms occupied. This is of the double block type, with twenty rooms in all. The total cost was about ₱22,000.

Work on the Labo School, a standard No. 4 building, and on the Libmanan school, a three-room temporary building, has been started. During this quarter the Calabanga and Buhi School buildings have been completed.

Repairs are being made on the High School building, Naga Central School, Constabulary Barracks and Daet presidencia buildings.

ANTIQUE.—Much activity has been put forth in the last two months on the Antique–Iloilo Interprovincial Road. As a result, 3 kilometers of second class road have been completed. More work, however, could have been done by employing more men, were it not for the fact that the funds for this project are becoming exhausted.

Two hundred was the maximum number of laborers that were employed on the work, which involved an expenditure of ₱4,000 a month. In order that the work may last until December, and that all the first course materials collected during the last dry weather may be spread, the maximum number of laborers employed was later limited to 150 men a day. It is expected to have 4.5 kilometers of second class road completed by the time the money is exhausted.

Labor conditions in this province have been a serious problem during the year and, in fact, for seven months our road work was paralyzed.

It is a well-known fact that the laboring class in this province only feels the need of public works during the latter part of July when the planting season is over and they can leave the crop until October, when they have to prepare for the harvest. In view of this fact, the district engineer has adopted a plan which, if supported, will improve labor conditions in Antique.

The plan is as follows:

Labor agents are requested to furnish the Bureau only laborers of permanent character, that is, laborers who will agree to work for a period of at least two months; otherwise, the agents' laborers will be considered to be of temporary standing and preference would therefore be given to the foreman's laborers of temporary character. A certain per cent of the Agent's commission is withheld as a bond against the laborers' refusal to fulfill their contracts.

The labor agents impose similar conditions upon laborers by holding a certain amount of their wages as security against failure to fulfill their contracts to the agents. Practise has shown that this arrangement is satisfactory and that in this way, the Bureau may expect to have in the future laborers of permanent nature and to improve the efficiency of laborers.

In spite of the critical labor condition, however, practically half of the total appropriation was expended within this year. So far, expenditures have been incurred in the following manner:

Miscellaneous and transportation	₱4,380.00
Laborers	19,160.00
Materials	1,860.00
Surcharge	1,290.00
Pending obligations	1,850.00
Total	28,540.00

The amount of work that was done can be summarized as follows:

(*a*) Transportation and delivery to the site of a 10-ton road roller, 15 tram cars and 4.5 kilometers of tramways; (*b*) the collection of 3,800 cubic meters of first course surfacing materials, enough to complete 4.5 kilometers of second class road and (*c*) the completion of 3 kilometers of second class road.

Three and a half kilometers of the Sibalom-Malandug Road have been completely metalled and a wooden trestle bridge of 25 meters span has been built across the Catungan River.

With the remaining funds, 2 or 3 kilometers of grading are expected to be completed within this year.

Materials for a wooden trestle bridge of 15 meters span on the Sibalom-San Remigio Road are already in place and construction will be immediately undertaken. Also, the materials for 3 double pipe culverts and a box culvet have already been received and as soon as weather conditions will permit, construction will be taken up vigorously. Work on surfacing was started this month.

Materials for 3 wooden trestle bridges of 15, 10, and 5 meters span, respectively, on the San Jose-North Road, are already in place and their construction will be immediately pushed to completion. The construction of 8 pipe culverts of different sizes will be started upon the receipt of the materials that were requisitioned in June, 1918; and a second class road from Tibiao to Culasi will be constructed.

The survey of the Bitadton-Pandan section, 22 kilometers long, has also been commenced. Plans when completed will be submitted for approval.

An allotment of ₱25,000 has been made for the Antique-Capiz Road and work was resumed on June 1, 1918.

The construction of a self-recording gauge staff at the Bongboñgan River was completed on August 22, 1918. It replaces the non-recording gauge staff which was washed out by a flood.

On account of weather conditions, the investigation and survey for the irrigation project of Patnoñgon has not yet been commenced.

BATAAN.—A new forestal station building is in progress of construction at Limay under the supervision of the district engineer of Bataan, the wooden materials of which are being furnished by the Cadwallader-Gibson Lumber Company of that municipality. Construction was started on August 16, 1918, and it is expected to be finished at the end of September. The money expended for this project was appropriated by the Bureau of Forestry.

The Calaguiman Bridge situated at kilometer 8 of the Balanga North Road has been greatly improved. Its northern and southern approaches were made easier grades, the deck leveled and the sides sheathed with lumber, and now present a pleasing appearance to travelers. The south end of the west foundation was protected from the effect of floods with bamboo stakes.

The Talisay collapsible bridge was greatly damaged by the typhoon of last July. Most of the posts and floor spans were torn to pieces by the swift current. Repair work was started, and is expected to be finished before October 12, 1918.

About 1.6 kilometer of the Bataan section of the Pampanga-Bataan Interprovincial Road is being surfaced with gravel and 1 kilometer of it is already rolled. Kilometer 110 of same road is being subgraded. This section of the road was usually impassable during the rainy season of the year due to lack of ditches, but at present good drainage is being provided to make it passable throughout the year. The approaches to the Balsic Bridge, at kilometer 106, were damaged during the two past typhoons of June and July of this year. No effort has been made to fill in the approaches which were scoured out, but instead, two spans of six meters were added on each end of the bridge.

Three tiendas 4.35 by 5.00 meters each, are being constructed on the Orani market site with the remainder of the market appropriation. These tiendas will be finished about the end of September.

The materials for the Bagac-Moron telephone line have already been delivered by the Bureau of Supply. Construction has been under way since the end of August.

The drilling of an artesian well with 2-inch casing for the Philippine National Guard on the site of the proposed cantonment at Orani, was commenced during this quarter but was discontinued due to telegraphic orders from the Philippine National Guard authorities.

BATANGAS.—As a result of the heavy rains in the later part of June, 1918, it is estimated that the road from Lemery to Nasugbú has been damaged to the amount of ₱20,000. A long wooden bridge on kilometer 141 near Lemery was washed out and the Obispo bridge on kilometer 171 between Balayan and Tuy was seriously damaged. Repairs on these two bridges are now in progress.

Work on the Tanauan-Talisay Road is paralyzed, due to the heavy rains and lack of stone.

Grading is now being started on the Lipa-Balete Road.

Surfacing will start very soon on the Rosario-Bolbok and Bolbok-Candelaria roads.

The Nasugbú and Balayan markets have been completed and turned over to the municipal authorities.

The Alitagtag Standard Plan No. 4 school building, which cost ₱12,632.37, has been formally accepted by the Director of Education.

The construction of the Cuenca Standard Plan No. 4 school building is progressing very slowly due to the difficulty in hauling materials to the site.

Construction on Bauan central school building is suspended due to lack of funds.

No bids were received for the construction of the Apolinario Mabini memorial school building and it will have to be done by administration. This will be a Standard Plan No. 4 school building with a special type facade and will be located in the barrio of Talaga, municipality of Tanauan, Batangas.

The work on the Batangas water system is now in progress.

BENGUET.—Work was started on a new addition to Hotel Pines September 2. Foundations are completed and frame work 75 per cent complete. The building should be finished so that the new portion can be occupied by December 15.

Repairs and alterations of Bua school are progressing nicely. Work should be completed by December 31.

The Benguet Road was damaged to the extent of ₱15,000 during the months of July and August. A small slide on kilometer 24 wrecked a 118-foot Howe Truss; an extremely high flood at Camp One washed out the timber trestle at Camp One. The road was closed for a period of four days.

The Trinidad Presidencia was completed September 2.

The new water tank, a circular reinforced concrete structure having a capacity of 100,000 liters was completed during this quarter. This gives the city of Baguio an ample fire protection with sufficient pressure to reach any part of the city.

The academic building, a standard plan No. 7 (wood) of the Bureau of Education is under construction on Trinidad farm school.

Work on the new market and animal shed is progressing nicely; both buildings are ready for roofing.

Materials have been collected and contract let for constructing a suspension bridge across Trinidad Creek at the farm school.

The Benguet Auto Line transported during the period from July 1 to September 27, 1918, 340 first-class passengers, 479 third-class passengers, 4,220 kilos of hand baggage, and 129,276 kilos of express and freight.

Summary of traffic over the Benguet and Naguilian Roads from July 1 to September 27, 1918.

Name of Road.	Pedestrians.	Bull-Carts.	Animals. led or ridden.	Calesas.	Motorcycles.	Automobiles passenger.	Automobiles truck.	Wagons.
Benguet Road	1,405	1,035	1,016	1	5	265	489	5
Naguilian Road	1,860	2,299	947	28	41	259	750	-------

BOHOL.—Great progress has been made on the construction of Loay–Interior Road. The subgrade work is in kilometers 51, 52 and 53. A big cut of 4,425 cubic meters of anapog and rock on kilometer 53 is about 50 per cent finished and when this is completed, the subgrade work to Carmen (kilometer 59) will be easy. The metalling and culvert construction follow closely and by the end of the year the first class road will be extended to kilometer 52, municipality of Batuan.

The construction of Bacani–Carmen Road started last July, but as there is a scarcity of labor on that section, the work is slow. Only about one half kilometer of subgrade is finished. This section branches off from the Tagbilaran–North Road between kilometers 52 and 53 and connects the north coast towns with the interior towns of Carmen and Sierra Bullones.

The province appropriated ₱23,000 for this road to start with, and with the amount of labor available at present, this sum will last until the end of the year at which time it is expected that 6 kilometers of subgrade will be completed. This road passes through a mountainous country.

The province also appropriated ₱5,000 for the Inabanga–Jetafe Road and the work was started, but very little could be accomplished because the people refused to work for less than 60 centavos a day.

The sum of ₱20,000 was appropriated for Quinoguitan–Sevilla Road and the work was started June 15. This road branches off from Loay–Interior Road between kilometers 31 and 32 and is about 5½ kilometers long. This amount may not be enough to finish the subgrade work, because it passes through a mountainous country. About 1½ kilometers of subgrade has been completed.

Work on the Guindulman–Cogtong Road (eastern part) has been slow. The people refused to work for the usual rate of 50 centavos per day, and the daily wage has been increased to 60 centavos.

Successful work has been done on maintenance of first, second and third class roads. Plenty of resurfacing materials have been placed along the roads for repair of ruts, and new depositories were constructed on some sections.

The only buildings under construction now are the provincial High School and the provincial Warehouse. Four rooms are being added to the provincial High School (Pasig Type) and will cost approximately ₱29,000.

The construction of Dawis bridge and Tagbilaran causeway will be advertised for bids as soon as the bridge plan is received. These works are close to each other and the intention is to advertise them together to present a more inviting prospect to contractors. The bridge has an appropriation of ₱16,000 and the causeway ₱15,000.

There are several wooden bridges to be built, but due to lack of materials, nothing has been done yet.

Four municipalities have appropriations for investigation of water works systems. The municipality of Jagna has ₱24,000 for a waterworks system and as soon as the plan is received from the Manila office, the materials will be promptly requisitioned.

BUKIDNON.—During this quarter work in Bukidnon District has been confined almost entirely to road maintenance and as the funds remaining only allow a monthly expenditure of about ₱1,300 for maintaining some 114 kilometers of second class road it is something of a problem to keep it passable.

The roads in this district are dirt roads, unsurfaced, averaging about four meters wide, practically without ditches.

The biggest problem which Bukidnon has to contend with is transportation; and now, since the foot and mouth disease and rinderpest has gotten among the cattle, followed by quarantine regulations which hinder the use of those remaining, and this together with the present scarcity of gasoline, the transportation available in this district is practically confined to the hauling of rice, etc., the necessary office supplies and hemp.

The district engineer's office will have no difficulty in road construction, but in construction of bridges and buildings no results can be expected unless local materials are used almost exclusively until there is a decided improvement in transportation facilities in this district.

Construction of two No. 3 standard school buildings of wood will shortly be commenced, one at Linabo, the other at Impasugong. Five thousand pesos for each of these buildings has been made available. This will necessarily be slow work as the lumber is to be obtained locally, by sawing it out in the nearby forests.

The constructon of the office and quarters of the superintendent of schools, for which ₱6,400 is available, will be started as soon as the materials are on the ground.

An appropriation of ₱12,000 will shortly become available for the Malaybalay water supply system, a gravity system, the source being about 3.6 kilometers distant from and 90 meters above the town. The greater part of the pipe needed is already at Maluco, 46 kilometers away, and the construction will begin as soon as the materials arrive at Malaybalay.

BULACAN.—During the last quarter an unprecedented heavy rain has fallen over the province causing the rivers to overflow their banks. Many roads have either been washed out, or have been made impassable. The Paombong–Hagonoy road suffered the most. Over this road there was no vehicle traffic for almost a month. However, such traffic has now been resumed.

The construction of the concrete spillway about 600 meters long on the Pulilan–Calumpit Road is now definitely suspended till the dry season. The subgrade on both shoulders of the road is so soft that no vehicle traffic can pass, and if work is prosecuted it means stopping vehicle traffic over this important road. It must be born in mind that this road is the only highway outlet of the provinces of Pampanga and Tarlac to Manila. There has been prepared, however a detour route, but no vehicle traffic can use it during the wet season.

No actual construction on the Sibul Spring–Biac-na-bato trail, for which the sum of ₱20,000 has been alloted has been undertaken as a shorter route, other than those previously surveyed, has been found. The survey for this new location has already been made, but the plan has not yet been approved.

Work on the Santa Maria Bridge construction is progressing satisfactorily. Half of the 35 reinforced concrete piles have already been driven. It has been found, however, that one half of the bed of the river is underlaid with hard adobe strata and a boring is now being made to determine its thickness. If it is not too thick, dynamiting will be used to permit the driving of piles.

The construction of the Calumpit school building is suspended due to lack of funds.

Requisitions for school buildings (Wooden Type) for the municipalities of Bulacan, Polo, Pulilan and Bustos have already been sent to the Bureau of Supply and as soon as the complete materials are received construction will be undertaken. The sizes of the buildings will be the Bureau of Education Standard Plan No. 10 for Bulacan and for the rest the No. 7 plan.

CAGAYAN.—Work on the construction of the interprovincial road between Claveria and Bangui has been suspended due to lack of funds. Subgrade is completed up to kilometer 7.

The typhoon that passed through this province on June 29 did but slight damage to the port works at Aparri. The damaged parts of the groin have been repaired, and groin No. 4 is now completed. The frequent blowing of the strong north-wind and the high tide make it temporarily impossible to continue this work.

Work on the Aparri–Lal-lo Road is progressing satisfactorily, in spite of the scarcity of laborers in this province at the present time. The grading is completed up to kilometer 19, just at the entrance to the town of Lal-lo.

The dredging of the port is finished. Steamers can now enter the port without difficulty.

The construction of the first class road on the Tuguegarao–South Boundary section progresses very nicely, although difficulties have been encountered in hauling gravel from the pits. Carabaos and carts have been engaged with private persons, hauling tobacco. To remedy this situation, 15 bull carts were ordered from the Bureau of Prisons. These carts when received will undoubtedly relieve the transportation difficulties. More than 3 kilometers of this road have been completed. Subgrade is now finished up to kilometer 9.

On account of the delay of the form lumber ordered from Zinundungan, Gattaran, work cannot be started on the Peñablanca Presidencia.

CAPIZ.—The floods of July 1 to 3, 1918, in the Aclan section, damaged the Ibajay concrete approaches of the Sooc pile overflow bridge. It scoured between the piles to a depth of 3 meters forming a deep pocket under the 5-meter slab. Temporary wooden bents were added on both approaches for auto and cart traffic. This temporary repair was made in order to observe the future behavior of the Sooc creek.

In spite of the high cost and scarcity of gasoline, the Ford trucks of this province are giving excellent results in hauling screenings and gravel for maintenance work. So far, the average cost per kilometer meter is as low as twenty centavos. This includes all possible charges on the capital investment. A detailed report will be published as soon as sufficient data is gathered covering a period of not less than a year's use.

The work on the Mianay–Sigma Road is progressing very rapidly. Only 1½ kilometers of grading remain uncompleted. Seven and a half kilometers of subgrade have been finished.

The work on the Navas–Pandan Road was resumed last month. There are now completed on this road the 2 kilometers from Navas to Solido, which will be declared first-class on December 31, 1918.

The construction of the Ivisan–Loctugan Road was started on September 10, 1918. There is now practically completed one kilometer of rough grading from Loctugan. This road is expected to be completed by February, 1919.

The second–class Numancia–Lezo–Malinao Road and the Banga–Malinao Road are both completed and opened to traffic. The others, Ibahay–Navas and Banga–Sigcay are nearing completion, the grading on these roads being now complete. Surfacing is progressing very rapidly.

The Loctugan concrete school building plan No. 7, with nipa roofing, was completed last July and is now occupied. A partial plan No. 20 is under construction at Capiz, which will cost when completed some ₱30,000, with temporary nipa roofing. Also, a plan No. 10 is under construction at Pontevedra, with nipa roofing. The estimated cost of this building including grading of site is ₱25,500. The site alone involves some 4,000 cubic meters of earthwork.

The High School of Capiz was totally destroyed by fire on August 29, 1918. The cause of the fire is unknown. The estimated total loss is some ₱100,000. Nothing was saved. The provincial board has appropriated ₱10,000 to put up a provisional roofing on the burned walls, to be used temporarily until the construction of a new High School can be completed. The board propose to obtain a ₱150,000 loan from the National Bank to build a modern concrete High School on a new site opposite the Mission hills, ½ kilometer from the town of Capiz.

CAVITE.—Metalling work on the Naic–Indang Road has been suspended during the last quarter due to excessive rains. Even the local adobe, which is being used for a foundation, and part of the subsoil could not be worked. However, subgrading was continued. There is now on hand enough broken stone to finish the road.

The repair of the Culong-culong Dam was completed recently.

Actual work on the Alfonso school has been started, but was suspended at once, as it was found that no more funds would be available to carry on the work. This structure is a Bureau of Education Plan No. 7 with adobe outside walls which are being carried down to the foundations.

The ₱3,500 additional appropriation which was thought to be enough to finish the Indang central school (another No. 7 plan with adobe walls) was hardly enough to buy the materials (shell windows with their fixtures; partition and ceiling lumber and porch floors) to complete the building.

The construction of the Indang farm school which was reported last quarter was also suspended due to shortage of funds. However everything is completed except painting the wood work.

The work on the Indang market has also been suspended for shortage of funds. However, everything is completed except the two triangular sections of the floor at both ends. Had not the price of guijo lumber gone to ₱370 per thousand the building should have been completed within the appropriation of ₱15,000.

The work on the Silang market is now in full sway. All the materials except gravel and sand are now on the site. It is expected to have the building finished during the next quarter.

Funds for the repair of four irrigation dams and ditches on the Friar Lands within the province were allotted some time ago but no work has been done yet, as at present the transportation of materials is almost impossible. Hauling is over rice paddies.

Repair of the Naic–Maragondon Road, a 7-kilometer stretch, has been completed during this quarter, as it was almost impassable during the rainy season. Gravel 10 centimeters thicks, 2 meters wide, was placed and it is now in excellent condition.

Preliminary investigations for Silang and Indang water supplies were made recently.

CEBU.—A standard market 18 by 36 meters in size has been completed at the barrio of Compostela, Liloan, at a cost of approximately ₱15,000. A standard market 18 by 36 meters at Danao is nearing completion. At San Fernando a standard market 21 by 36.1 meters is very nearly complete also. Sibonga will soon have a standard market type B, 24 by 42.8 meters. All materials for the foregoing markets are supplied by the government and the labor is being done by contract.

The construction of the Bogo market is under way. Materials are being gathered at Cebu and will be shipped to Bogo as soon as possible.

A part of a standard Plan No. 20 school building is being constructed at Carcar. Owing to the high price of galvanized iron roofing, the building is roofed with a good grade of nipa. The building when completed will have 12 rooms.

An appropriation of ₱7,531 is available for the completion of Talisay Central School at the municipality of Talisay. The work will consist in constructing one wing of a Plan No. 6 building. Most of the materials are on hand and the work will be started in the latter part of October by administration.

The second story of the Boloc-boloc Sanatorium at Barili is under construction. The work is being done by administration. The absence of substantial columns to support the trusses of the second story makes it necessary to destroy some portions of the walls of the first floor.

The extension of the existing Naga Water Works at the municipality of Naga is being undertaken by administration. The work consists in laying pipe lines throughout the población and installing six service hydrants. When this work is completed nearly all of the inhabitants of the town will be supplied with good water. Some houses are already connected with the water supply.

The Barili Water Works is under construction by administration. Three hundred and eighty meters of main pipe line from the spring to the town are of 6-inch concrete pipes, and about 1,250 meters are of 4-inch cast iron pipe. Main pipe lines in the town are two and three inches in diameter.

The materials for Pilar Water Works are on hand and the construction by administration will be started, as soon as possible.

The area reclaimed by the new wharf construction will soon be filled by an hydraulic dredge, making a large area available for the construction of warehouses, or other commercial buildings. This filling will begin as soon as a dredge arrives for this purpose.

COTABATO.—No project notes received.

DAVAO.—The Davao–South Road is about 60 per cent completed to date although the course of construction is a little slower than it should be owing to the limited number of laborers available during the past few months, which made systematic work difficult. Contract laborers are pouring in, however, from Manila, Cebu, Iloilo and Negros, and it is believed that with these laborers construction can be pushed to early completion, provided, however that enough money is set aside for the purchase of about 2 kilometers of tramway and 8 tramway cars together with 2 trucks.

The curves of the Davao–Santa Ana Road have been widened to an extent of 2 meters on both sides, thus giving an ample way for the traffic which is now increasing, and making vehicle collisions no longer inevitable. Four lights on top of concrete posts located on the curve assist in making the road safe for the night traffic.

At the request of the provincial board a cottage of the ordinary type has been built and is now occupied by a number of employees in this capital. Two more cottages of the same design will be constructed as soon as contract for the construction thereof is executed with Mr. J. Quibilan Kaway, the lowest bidder; the sum of ₱10,000 having been appropriated for the three cottages altogether. It is the intention of the provincial board to provide quarters for the government employees located in the capital at the lowest cost possible, as house rent in this locality is much higher than in any other place in the Philippines.

Government Employees' Cottage at Davao, Davao.

The Cuabo–Mati–Boston Road is being improved. The trail from Mati to Cuabo will have a maximum grade of 5 per cent. The traffic will in a few months no longer be forced to climb up high mountains as the work is being rapidly carried on. Materials are also being shipped for the repair of seven bridges on the Boston–Mati Road.

The Constabulary building and water tank at Mati have been repaired and reconstructed.

The construction of the Sea Wall at Mati is being continued.

The road between Davao and Talomo will shortly be declared first class. About 150 men are working at present.

The work on Santa Ana Docks is being done as fast as funds permit.

The Davao–North Road construction is progressing nicely.

Twenty-eight private buildings are now being constructed in Davao.

The proposed new government buildings are 13 in number and include a hospital, municipal buildings, markets, etc.

Telephone posts between Davao and Santa Ana are being replaced with concrete ones.

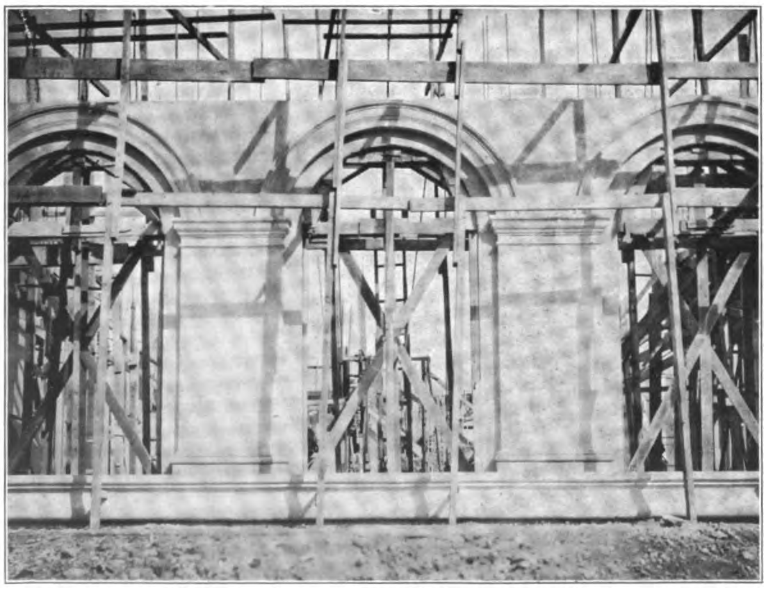
ILOCOS NORTE.—During the rainy season it has always heretofore been necessary to locate the Bacarra River ferry at a place upstream, over a kilometer distant from the old bridge site, because of the swiftness and strength of the current and thus the distance is greatly increased. This has been remedied by installing a wire rope, 1½ inches in diameter, across the river near the bridge site, and the balza is made to move automatically by means of a pulley running along the rope. This has given great satisfaction and the necessity of making a long detour has, for the time being, been eliminated.

A temporary wooden bridge of two 6-meter spans is being constructed across the Davila estero on the Bacarra–Bangui Road, which is a great obstacle to traffic after a heavy rain, as it rises to flood height very quickly.

During the month of August and the first three weeks of September such excessively heavy rains fell that considerable damage was done to the roads. This is particularly true of Dingras–Banna Road; kilometers 7 to 13 of the San Nicolas Road and kilometers 13, 14, 16, 18 and 28 of the Laoag–South Road, all of which sections became very muddy. Extraordinary efforts are being exerted to bring them to their normal condition.

On the Bangui–Claveria Trail only 200 laborers reported for work in September. Malarial fever which spread among the workmen on this project last summer, is believed to be the cause of the scarcity of working men reporting at this time. Efforts are being made to induce those who have already recovered to return to the work.

Work on the provincial capitol building progressed rapidly until September 18, when construction was suspended on receipt of advice that the loan applied for by the province cannot be granted. The building has been concreted, for the most part, up to elevation 12.



A View of the arches West Side, Ilocos Norte Capitol.

Construction work was suspended on the Vintar school building on August 21 and on the Paoay school building on September 22, due to lack of available funds.

Repairs to the Constabulary Barracks will be made as soon as the ordered materials arrive.

ILOCOS SUR.—Due to excessive rains during the last quarter the condition of the first-class roads is not as good as desired. During the month of July we had 29 days of continuous rain, some sections of roads becoming a little soft. However, the sections partially destroyed have been restored to their former condition.

The 20-room school building which is being constructed in the municipality of Vigan is near completion.

The 4-room school building which is being constructed in the municipality of Santa Catalina is near completion, but work will have to be stopped on same on account of shortage of funds.

The Bantay–San Vicente–Catalina–Bayubay Road has been completed.

The work of constructing bridges, culverts and spillways on the Vigan–South Road is progressing rapidly. All bridges and culverts which were proposed to be constructed out of the ₱50,000 insular allotment are nearly finished and will be completed within the estimate.

ILOILO.—The subgrade on some of the first-class roads has suffered from the heavy rains during the past quarter and some sections are not in the condition they should be, especially the San Miguel–Leon Road. There has also been considerable trouble from the temporary bridges due to the same cause. The two spillways placed on the Iloilo–South Road proved failures. By their failures, however, it does not mean the spillways should be condemned. It is believed that spillways with sufficient openings for the ordinary water in dry season to pass are the only solution for Iloilo Province where there are so many rivers with wide flat channels and low banks. The two spillways in question were constructed without foundations and also extended to the limit of the low water. Spillways for these streams will be very cheap, as compared with bridges, but the ones constructed were too cheap.

The rains have prevented placing of any surfacing materials on new work during the past quarter, but grading has progressed very nicely on all roads under construction. Grading is now all being done by the paquiao system and is proving very satisfactory, much more rapid, and cheaper than by day labor.

The grading on the Oton–San Miguel Road is practically complete; Zarraga–Barotac Road is all under construction and should be completed within a month; on the Janiuay–Lambunao Road two kilometers have been completed and three more are under construction; on the Barotac–North Road grading has been started; the grading north of Tinorian; and on the Iloilo–Antique Boundary Road, the heavy cut west of the Tiolas River, have been completed.

The temporary High School building which was originally planned as a standard No. 10 structure was changed to an eleven-room building by extending one of the wings. The cost of same was approximately ₱8,700. A room was added to the rear of the grand stand on the High School grounds as a dressing room for the athletic team. The service pipe was extended and showers installed, which were very much needed.

The Iloilo Sea Wall has progressed more rapidly the past quarter, the last block placed was completed within 24 days at a cost of approximately ₱700 per lineal meter, or ₱35 per cubic meter of concrete, including all piling and reinforcement. A great deal of time and dredging was saved by driving a line of piles on about 4 feet centers in front of the old wall and rear of the new work and lashing back; this held the old wall in place and prevented a lot of material from falling in that otherwise would have. The wall has been completed to the south end of the landing in front of the Custom House.

The municipality of Iloilo placed the repair of certain streets under the supervision of the district engineer's office and transferred the necessary funds. The work has been completed to the great satisfaction of all auto drivers.

ISABELA.—The construction forces on the Ilagan–North Boundary Road have made good progress, in spite of the scarcity of laborers and the rainy season. Two and one-half kilometers remain to be completed before the Cagayan–Isabela Boundary will be reached. Surfacing will be put on the 3 kilometers of subgrade already completed as soon as the supply of gasoline for the 1-ton Ford Truck arrives. Construction was started from San Pablo towards Tumauini and from the end of the first-class road at Rugao towards Tumauini.

Day and night gangs are busy on the Angadanan–Cauayan Road. Only 3 kilometers remain uncompleted on this project. It is expected that this road will be finished before the middle of December. Laborers on this and other construction projects are attracted and made to stick to the job by the new system of the weekly payments and advancing to each individual laborer his week's supply of government rice. With the concurrence of the provincial treasurer, strong circulars were issued to each deputy municipal treasurer to pay road construction laborers punctually every Sunday morning. This system together with the advanced government rice given to each laborer, created contentment and satisfaction on the part of the laborers, thus attracting and inducing many to work on the roads.

About 60 per cent of the materials requisitioned from Manila for the Cabagan central school, Bureau of Education Standard Plan No. 7, have arrived. Sand and gravel for this construction have already been gathered and placed on the site. Construction will be started as soon as the rest of the materials arrive from Manila.

Work on the Naguilian Presidencia is progressing nicely. The concrete foundation has been completed and about 50 per cent of the lumber to be used has been prepared, sawed, and placed on the site.

The following structures were completed during this quarter: Provincial Building Enlargement, which was occupied on September 1, 1918; Cauayan municipal school on August 1, 1918; shop and Domestic Science at Ilagan on September 1, 1918; and Upi River timber pile bridge, which was opened for traffic on September 15, 1918.

Particular attention was given to the maintenance of first-class roads during this quarter. With the limited funds available, the narrow subgrades were widened to standard sections, and the three-meter surfacing was increased generally to 4 meters although in some places to only 3.5 meters.

LAGUNA.—The Los Baños Quarry has been keeping up its record breaking performance since the first of May, 1918. The output for April, 1918, was 1,940 cubic meters of crushed rock and screenings; for January, 1918, 1,960 cubic meters; for February it dropped to 1,460 and rose in March to 1,660. But the outputs for May, June, and July, 1918, all ran over 3,000 cubic meters. Stormy weather in August caused it fall short of the 3,000 mark by 33 cubic meters only.

The average monthly output for 1917, was 1,733.60 cubic meters; the highest month was November with 2,834.67 cubic meters; the lowest was April with 980 cubic meters.

The results for July and August of this year are all the more striking from the fact that the crude oil Crossley engine operated without its customary fuel. A mixture of kerosene and lubricating oil was used instead of the proper crude oil for which it was designed. The operation of this mixture was as smooth and efficient as its former fuel, but, of course, more expensive.

The unit cost per cubic meter prior to the introduction of kerosene averaged ₱1.06 from January 1, 1918 to July 15, 1918. Since the change to kerosene this unit cost increased to ₱1.65 per cubic meter. This unit cost, however, is far from final since it does not include depreciation, nor the supervision of the district engineer and one assistant engineer. On the other hand it does include one item formerly met by the consignee, viz, the cost of loading.

Machine drills have been used at the quarry out since April, 1918. These drills should be operated by compressed air, but since no air compressor is available they have been operated by steam from a locomotive type boiler.

The fuel for this boiler has been, at various times, coal, cocoanut shells, and firewood. Comparative observations give the following result:

For one day of 9 hours—

Coal alone 286.80 kilos at ₱0.033 per kilo	₱9.46
Cocoanut shells alone 714 kilos at ₱0.006 per kilo whole shells	4.28
Firewood alone at ₱10 per cord	2.00

The Crossley engine operating on crude oil consumes 8.13 liters per hour costing ₱0.05 per liter. Its average run per day is 6 hours.

Drilling charges include the labor of 3 men per drill, plus 2 men at the boiler, plus the fuel costs, totalling ₱5.80 per day. It is estimated that 134 tons of rock are broken up daily, hence the cost, without overhead charge is ₱0.043 per ton.

The road section between Nagcarlan and Lilio has been completed and put into first-class condition, although there still remain one culvert to be put in and Nagcarlan approach to the Talahibeng Bridge to be surfaced. Automobile traffic, however, can negotiate this section at all seasons of the year. The second and the third course for the surfacing of this road was furnished by a small portable crusher and distributed by a 5-ton White truck. The stone for the fine rock came from a river about 400 meters from Lilio. The location of the crusher for maximum speed in getting out this fine rock was one of the problems of this project. If it were placed by the road side, then the stone must be brought up a 15 per cent or 20 per cent grade for the distance of 50 meters in addition to the haul along the river bank over a maximum distance of 100 meters. This location meant easy loading into the truck, but expensive and slow deliveries from the river to the crusher. On the other hand the crusher might be located near the river bank, the tramway dispensed with entirely, and a temporary spur road opened up through a cocoanut grove connecting the crusher and provincial highway. The danger of this location lay in the possibility that the spur road might be softened so much by the rains as to prevent the truck moving over it; its merit, obviously, consisted in short, easy hauls from river to crusher, and quick deliveries by the truck from crusher to highway. The decision of course, lay with the district engineer, who adopted the latter location in spite of many shakings of the head of a Bureau of Public Works official who had authority to disapprove this procedure flat-footedly if he chose. Happily no serious trouble arose that could not be overcome. The rains came and wet the ground, but two bands of surfacing were laid exactly on the wheel tracks of the 5-ton truck which moved smoothly in and out over these hardened lines without a hitch. In consequence the road was rolled before the heavy rainy season set in and opened to automobile traffic by April 15, 1918.

The provincial governor is superintending the work of 50 Bilibid prisoners on the Lumban–Santa Maria Road. These men have made great improvements in and about Paete and Mabitac.

Plans have been received and the materials will soon be ordered for the construction of a bridge over the Macampon River, on the road from Alaminos to San Pablo. Another member of the provincial board, Honorable Marcial Alimario, has taken a personal and gratifying interest in public works in this region of the province. The assistance which these provincial officials can give the district engineer, if so disposed, is a very considerable one.

Artesian well digging is in progress. Biñan has been satisfied for a while. Cabuyao is now being attended to, after which the outfit will be sent to Santa Rosa and then Pañgil.

A new four room reinforced concrete standard plan schoolhouse at the barrio of San Diego is now complete with the exception of the painting.

Permanent repairs have been begun on the Santa Cruz Bridge.

A one-meter trail on the approved grade has been almost completed from Pagsanjan to Cavinti and thence to Luisiana along the line of the new provincial highway. Those who have for years been ascending and descending the stairs formed by the old routes are expressing their wonder that it is such easy going up or down the new road.

The Santa–Cruz–Pila Road has been surfaced for two kilometers, and subgraded another two.

LANAO.—In so far as the weather conditions are concerned the quarter has been quite satisfactory. However, labor has given considerable trouble to road maintenance, and to aggravate conditions it only needs the present wave of sickness which has effected all the labor and seriously retarded the work.

New kilometer posts have been placed on the whole road, Dansalan–Keithley to Iligan, superseding the old mile posts from Overton to Keithley. The worst sections of the road have been rebuilt from kilometer 25 to 31 inclusive. This covers that part of the road which was finished by the Military about the year 1914, where the lower course of rock was very light, being 4 to 6 inches thick only. The worst sections were re-telforded, making a most substantial road of what were very poor sections.

The Tamparan–Kawawaig Trail is in very good shape. The section on the new relocation, which is 3.7 kilometers long, has been completed thus shortening the trial and moving it away from the foreshore of the Lake, where it was washed out during each rise of the Lake and was impassable during the rainy season.

The Ganassi–Malabang Trail has been repaired and is in very good condition. All trails in this province are maintained by periodic gang labor. This is the only possible way, as the funds available are limited and the territory to be covered is very extensive.

The construction of the Iligan–Misamis Boundary Road has been progressing very satisfactorily although there has been a labor shortage. During the last three months there have been 4 kilometers of subgrade prepared. Most of this however, has been light work. The heavy hill work is being left for the rainy season period, when work on flat ground will be difficult, or out of question. Temporary bridges are being built at those places where they will be required—some of these will be roofed. The alignment and grade on the sections already built could be used for a railroad grade, for the most part.

The Dansalan–Ramain–Masiu Trail is progressing very nicely and will be open from Dansalan to the Ramain River before the end of October. The trail is completed over all the heaviest grades and the lowest ground, making it serviceable to horse traffic, and carts likewise, as soon as all bridges are in. While it is termed a trail, in reality, it is a good third class road.

The construction of the Overton Wharf has been progressing quite satisfactorily up to recently, when the wave of sickness struck the labor gang and, since that time, progress has been retarded. This, likewise, effected the delivery of the lumber and some piles. During September there were 17 pile bents driven and capped. The driving is all in fine sand, but none of it is at all easy. The monsoon is beginning to change and this will interfere with the construction of the wharf, for when the northeast winds begin it will not be an easy job to drive piles in rough water.

An investigation has been made for a proposed water supply system and hydro-electric power development. The Dansalan–Keithley power development would furnish power for pumps, electric lights and for such other purposes as might be necessary.

Surveys and investigation are now in progress for the purpose of lowering the level of Lake Lanao to unwater certain agricultural lands and to reduce the damage that occurs during the floods of the lake to growing crops planted along its eastern shore.

LA UNION.—The repair of the subgrade of the Agoo–Tubao Road, which was closed to traffic due to the destructive effects of the last typhoon and heavy rains, has just been terminated. All the concrete culverts on this road and a standard timber trestle bridge of three spans of 6 meters each at kilometer No. 3 have been completed, and the construction gang is now working in kilometer No. 1 on the diversion of the course of the stream in order to bring about a safe and economical culvert site,

The surfacing of the Camp One–Aringay Road has progressed rather slowly for the last three months, due to heavy rains, with the resulting difficulty of getting gravel from the river beds, which are flooded most of the time. The work is progressing satisfactorily at present, and it is expected, as the dry season approaches, that sufficient amounts of gravel will be available to warrant the employment of a large number of bullcarts. The following reinforced concrete rectangular culverts between Damortis and Agoo on the Camp One–Aringay Road have been completed.

No. 264.16—2.50 by 1.50 meters (double.)
No. 264.80—1.50 by 1.00 meters (double.)
No. 266.02—3.00 by 1.50 meters.
No. 266.21—3.00 by 1.50 meters.
No. 266.76—2.50 by 1.50 meters (double.)
No. 267.94—5.00 by 2.50 meters.

About one hundred and fifty lineal meters of concrete pipe have been placed between Camp One and Rosario.

The repair of the first kilometer of the Manila–North Road east of the Luna Spillway, kilometer 33 north of San Fernando, has been completed. This section becomes muddy every year during the rainy season. The clay subgrade on being subjected to heavy traffic works up through the gravel surfacing when it rains continuously for one or two weeks, caused probably by the yielding of the subgrade when saturated with water. Reconstruction of this section was accomplished by increasing the surfacing by amounts varying from 5 to 10 centimeters, removing the earth where it has come out of the gravel and giving more crown to the road. The purpose is to increase the bearing capacity of the gravel layer and to afford a more impervious covering for the subgrade. A diversion of the stream was made at kilometer 38 of San Fernando North Road to prevent the scouring of the Balaoan River on the west side of our road. At this point the river meanders and the new channel was cut through the neck of its "S" shape course thereby effecting a straight waterway.

The flood caused by the typhoon on June 29 washed out the two collapsible bridges at Bauang and Naguilian Rivers and the south approach of the Maragayap collapsible bridge, and caused an appreciable damage to the first class roads.

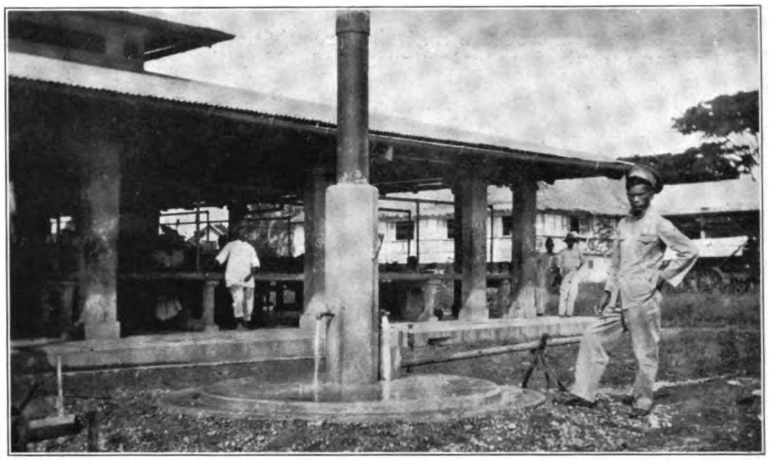
LEYTE.—Three kilometers of subgrade has been completed on the Maasin–Matalom Road. The work is being done by a contractor from Cebu, Mr. William Crooks. The new road follows the old Spanish road for about 1½ kilometers and the rest is a new location altogether. The total length is about 27 kilometers.

The contract for the construction of the Baybay–Abuyog Road was awarded to Mr. Louis Chapman of Palo. Actual construction was started August 27, and about 800 meters of subgrade has been completed. A survey party is now working from Abuyog towards Baybay to connect with the line surveyed last year, which was started from the mountains to the town of Baybay.

The construction of the Villaba–Palompon Road, a stretch of about 3 kilometers, started September 5. This contract was awarded on July 25, 1918, but due to lack of transportation the tools were not shipped until the first part of September. This work is the improvement of a third-class road by maintenance only.

All the foregoing roads are on the West Coast of Leyte and this is only the beginning of a program of road construction that will eventually connect the West coast with the East coast towns of the province. At present they are constructed as third class and will so be considered for some time. The specifications for first-class road construction are, however, being followed so that when the metalling is applied the road can be converted into first class. Only temporary bridges are at present being constructed.

The temporary bridges and culverts on the Carigara–Barugo Road are completed and July 15 saw the inauguration of this road to vehicular traffic for the first time in over twenty years.



Successful Artesian well located near the market of Ormoc, Leyte.

The completion of four other temporary culverts on the Tolosa–Dulag Road brings vehicular traffic to within 3 kilometers of Dulag. This section of the road would have been completely opened had the funds been sufficient to complete two other temporary bridges, over the Laibiranan and Calbasag Rivers. The work on this road has been partly voluntary as the coconut logs were furnished and transported free by the barrio people who also cleared that part of the road which lies within their barrio. This latter phase of the work was made possible through the efforts of Governor Demeterio in arousing the interest of the barrio people in the importance and necessity of roads.

The repair of the Tacloban–Carigara Road has been going on very satisfactorily. Weather conditions have been very favorable, and the decision of the provincial board in limiting the use of this road to trucks of 3-ton capacity, or less, is of inestimable value. The worst parts have been repaired, most of the depositories have been filled and the road is in excellent condition, except in places which could not be reached before the funds were exhausted.

The transportation of rock and gravel has caused considerable annoyance. Rinderpest reduced the number of carabaos in this part of the province and those that were left were used in hauling abaca and rice. The old price of 40 centavos per kilometer proved no attraction to carabao owners and even when the price was raised to 60 centavos only a few carabaos could be secured.

Then came the gasoline problem. Last year trucks from the Leyte Land Transportation Company could be had at ₱0.60 per kilometer-meter but this year the charge has been raised to ₱0.70 per kilometer-meter or ₱60 per day.

Except for a few bad places, the Burauen–Dulag section of the Palo–South Road is passable to automobiles during the dry weather.

Dredge No. 3 of the Bureau of Public Works arrived at Tacloban August 18, after a four day trip from Iloilo. Actual dredging operations began in the afternoon of the 20th. In 5 weeks, 25,200 cubic meters of materials have been placed behind the new wharf. This is about 70 per cent of the total amount of fill necessary. At first there was some difficulty in obtaining good materials, as only silt and mud were found near the wharf with a minimum depth of 7 meters. At a distance of 50 meters to the south, however, and nearer the beach, sand was encountered. This required more pontoon pipes, 15 of which had to be brought from Cebu, while about 60 lineal meters of pipe were made of one by three inch lumber, tongue-and-grooved, with No. 4 galvanized iron wire as hoops spaced 5 inches apart.

The construction of the provincial capitol has proceeded rather slowly. All the concrete work to the first floor is complete, including the concrete floor. The installation of the plumbing system is going on satisfactorily. Mr. Juan Ponce Remigio of Manila is the contractor for this installation.

All the wall forms are ready, together with the forms for the second flight of stairs, but because of the lack of white rock concrete cannot be poured. This rock is quarried at Samar and there is no launch that can be used to tow the scows loaded with this rock to Tacloban.

This white rock is crushed and forms the aggregate of the white finish of the building. In pouring the wall and in order to obtain a good bond between the white finish concrete and the body concrete the following method is used.

The form is placed first. Then a plain galvanized iron false form 30 inches wide is placed about 5 centimeters away from the outside face of the form to separate the white concrete finish from the body concrete. The white finish is poured first being kept about 15 centimeters ahead of the body concrete. The former is mixed by hand and the latter by a mechanical mixer. The false form is withdrawn as fast as the concrete, both white finish and the body concrete is poured. In this way good bond is obtained between the finish and the body concrete, which will not peel off as in the case of plastering.

All the materials, for the Palo Presidencia are on hand, but because the necessary loan has not yet been received, actual construction has not been started.

MINDORO.—The surfacing of the Calapan–Jolo Road has been completed to kilometer 7, and the work on grading has been pushed to kilometer 8.1. The reinforced concrete culverts which have been constructed recently have protected the road from being washed away by the floods. On account of the harvest of the rice crops and the shortage of labor in this locality, the grading work was somewhat delayed during the latter part of this quarter.

Subgrade work on the Pinamalayan–Jolo Road has reached the Pola River, a distance of seven and one half kilometers from the coast, while the work on clearing has been completed beyond kilometer 8.

Eight kilometers of alignment of the Naujan–Pola Road have been located and the controlling points have also been decided. Considerable difficulty has been met in carrying out the work efficiently due to the scarcity of labor and the great demand for men to work in the abaca and cocoanut plantations of private landowners.

Maintenance of second-class roads during this quarter has been difficult on account of floods which washed away some sections of the Calapan–Naujan Road and the wire cable for the Magasawang-tubig Ferry. Despite the lack of labor, the road has been repaired and is now in good condition.

During this quarter the following buildings have been constructed by administration: the Abra de Ilog Central School, Plan No. 2, Bureau of Education, semi-permanent type; the Silonay barrio school, Plan No. 1, also of semi-permanent type; and the provincial camarin for the Agricultural Demonstration Station.

The extension of the Calapan Water System to the Dock has also been completed during this quarter by administration. It is two and one-half kilometers in length, extending from the poblacion to the provincial dock. By the completion of this work, the Calapan Water System supplies almost the whole town of Calapan with fresh water and also encourages the people to build their homes towards the eastern section of the town.

Plans and estimates of cost for the following buildings have been prepared by this office; for the construction of a section of the Mindoro High School building of the Pasig type, for which ₱41,000 is available, and for the construction of the proposed presidencia building for the township of Naujan. It is expected that as soon as the plans and estimates of cost are approved the materials will be requisitioned, in order to begin construction immediately.

MISAMIS.—The condition of the first class roads of Misamis Province has been greatly improved since the first of the year, and the reconstructing of the Cagayan–Tagoloan Road is nearly completed, only 2½ kilometers remaining unfinished. Sixteen and one-half kilometers have been surfaced with stone and gravel. The greater part of this material was delivered by contractor Richard Barton at ₱3 per cubic meter, its transportation being open to any one wishing to haul.

We were very fortunate in securing the services of truck transportation, as throughout the year there has not been an entire month that the road has been open for animal drawn vehicles, owing to quarantine.

The roads of Camiguin show great improvement, as well as those of the West coast. The reconstruction of the Molugan Bridge became necessary and work on this project is now under way.

The reconstruction of the Tinao–Bukidnon Road shows less work for the amount of money expended than any other project the district engineer has ever had anything to do with, owing to the following reasons: All materials had to be hauled by truck transportation. Roller is run by gasoline and coal oil, and the Insular Purchasing Agent not able to fill requisitions for same, with the local market as high as ₱45 per case of gasoline, all contributed to make costs exceptionally high. No labor of any quantity could be secured for this work at less than a peso per day, and at that price the labor was of a very poor quality.

MOUNTAIN PROVINCE.—The typhoon of June 29 and the continuous heavy rains since then for almost a month have wrought damages on all public works in this province, in some cases of considerable magnitude.

The Bontoc–Tagudin Road, 123 kilometers in length, about 25 kilometers of which is second class, and the remainder third class has suffered as follows:

(1) The stretch between kilometers 8 and 15 of the second-class road was reduced to mud, which in some places was so deep as to render it impassable by carts for sometime,

(2) Between kilometers 18 and 19 of the second class-road a stretch of about 76 meters which borders the Kimpusa River was washed away during the heavy rains that followed the typhoon, leaving a road about a meter wide only, and

(3) In the section of the third-class road between kilometers 87 and 90, the whole mountain side where the road passes came down, starting from the top, and the road bed in many places was crossed by cracks, some of which were of some magnitude. In places where streams, coming down from the mountain, cross the road, the road bed was simply disintegrated and brought down by the water. Because of this damage, the whole Bontoc–Tagudin Road was closed to cart traffic for a little more than a week, after which time, repairs having been affected to some extent, traffic was uninterrupted.

The initial damage on kilometers 87 to 90 was only a start, and whenever it rains fairly hard, slides occur. For this reason, a gang of road tax laborers is constantly kept in this part of Bontoc–Tagudin third-class road. Since the typhoon, the cost of maintaining both parts of the Bontoc–Tagudin Road declared second and third class has increased considerably.

Plow steel cables for four suspensions bridges are now on the way and erection of one of them will be started as soon as the cables arrive.

There are seven township presidencias to be built according to standard plans, in this province, and work on one of these, the Bauko presidencia, was started in August. Work on another one, the Tinglayan presidencia, will be started by the end of September, and materials for the rest are now being collected.

The building for the Bontoc electric light plant (now called "Luz Calvo") will soon be finished. The generator for this plant is now in Bontoc, and on the arrival of the oil engine and other materials the power plant and wiring system will be installed.

Work on the Cervantes Hospital was resumed, as ₱5,000 was made available. Same is true of Lubuagan Hospital, as an additional ₱1,200 was also made available for this project. Work on the Kilangan Hospital will be resumed as soon as additional money is provided.

NUEVA ECIJA.—Through the assistance of Governor Carpenter, Director of Non-Christian Tribes and Governor Dosser of the Ifugao Province, there have been secured 1,500 Ifugao laborers for work on the San Jose–Imugan Interprovincial Road.

At present the work is in progress between Santa Fé, the junction of the above-mentioned road with the Nueva Vizcaya Road and Puncan, Nueva Ecija. All Non-Christian laborers are being used on this section. Fifteen kilometers of trail constructed on proper location has been completed through the mountainous section and also 6 kilometers of subgrade.

The Ifugaos are excellent laborers and in mountain work will do from two to three times as much as the ordinary Christian laborers. These men are given ₱0.50 per day and rations and are willing to work every day, Sundays included.

Good progress has also been made on the construction of the above-mentioned road between San Jose and Puncan, Nueva Ecija, where 8 kilometers of grading has been completed and 3 kilometers of surfacing has been placed. At present the entire road is passable for horses and it is expected to open this road to pack animals by December 31, 1918.

This will practically stop all traffic over the Villaverde trail and will enable the people of Nueva Vizcaya to transport their products and supplies over the new road to San Jose, Nueva Ecija.

The new road is being constructed with a maximum grade of 5 per cent and the distance from Santa Fé, Nueva Vizcaya to San Jose, Nueva Ecija, is only 57 kilometers. As this road crosses the Carraballos mountains at an elevation of 2,600 feet, it is much preferred to the Villaverde trail, which crosses at 6,000 feet.

The maintenance of first and second-class roads has been the most difficult work in this province during the past quarter. Since July 1 this province has had 72 inches of rainfall and the low lands portion of the roads of this province has been under water from two to five times each month since July 1.

The pay of camineros in this province is only ₱20 per month and as private parties are paying from ₱25 to ₱40 per month for laborers, it has been almost impossible to keep a sufficient number of camineros to properly maintain the first and second-class roads.

The transportation of gravel for the maintenance of first-class road has also been an exceedingly difficult problem. Gravel for maintenance is taken from river beds and the deposits are so small that the use of trucks is impracticable and all transportation has to be done by bull carts. Since the number of draft animals in this province is in the proportion of one animal to each six hectares of ground, it is impossible to get animals during the planting season for use on road work.

Two kilometers of grading has been completed on the Talavera River–Licab Road and at present surfacing has been placed on kilometers 141 to 146. If laborers can be obtained, the subgrade of this road will be completed to Licab by December 31 of this year.

One kilometer of grading and 0.5 kilometer of surfacing has been finished on Pinagpanaan–Rizal Road and work will be continued as long as laborers are available.

The construction of one-third of a Standard Bureau of Education 6-room school building in Peñaranda, has just been completed and the building turned over to the Bureau of Education.

All concrete work on a Standard 6-room school building in the municipality of Aliaga has been completed and if sufficient funds can be obtained it is expected to finish the entire building by December 31, 1918.

Work on a Domestic Science school building in Cuyapo, Nueva Ecija, has been 75 per cent completed and it is expected to complete this building within 30 days if materials can be obtained.

Two successful artesian wells have been drilled in the municipality of San Isidro during this quarter and at present Bureau of Public Works Rigs number 17 and 19 are idle while the crews of these rigs are working on artesian wells for the National Guard camp in Parañaque, Rizal.

NUEVA VIZCAYA.—More than 1 kilometer on the Bagabag–Isabela Road has been completed during the last quarter. At the present writing, the work on this section has been suspended temporarily awaiting new appropriations; the number of kilometers of first-class road completed, however, in accordance with the approved standard plan, is about nine. Kilometer 2 and kilometers 4.380 to 5.500 of the Bayombong–San Luis Road are now first-class, thus making an almost continuous first-class road from kilometer post 1 to kilometer post 20. The Bayombong–San Luis Road is more than 46 kilometers in length, 27.3 kilometers of which are already first class, leaving 18.7 kilometers to be constructed on this section. This is, by far, the most important project of road construction in this district, due to the gradually increasing traffic to and from the Province of Isabela. The Province of Isabela is at present the best market for rice and tobacco produced in Nueva Vizcaya which bring to Nueva Vizcaya people the greater part of their income.

In regard to school buildings, very little has been done. The Dupax school is at a standstill, awaiting an additional appropriation and when this is available all the materials will be transported to the school site and the work will be undertaken immediately. The construction of the Bayombong central barrio school has been discontinued, the appropriation and materials of this project having been transferred to the construction of a proposed High School building. When there are sufficient funds and the site and plans are finally decided upon, construction will be undertaken.

The Kasibu Trail is completed with the exception of the drainage culverts. Since this trail section is located through mountain ranges, it is naturally subject to slides and obstruction by falling trees. An appropriation for the construction of temporary culverts and maintenance must therefore be secured. The total length of this trail is 13 kilometers. The construction of the Dupax–Gumiad Trail was started recently. This trail is a continuation of the Dupax–Nantanaan trail which has already been opened and will lead into the wild country of the Ibilaos to join the Cagayan River at its source. It is expected that by the early part of 1919 the farthest point reached by the trail will be from 70 to 80 kilometers into the Ibilao countries.

Preparations are being made for the construction of the Trade School shop. As the available balance on hand is only ₱1,023.99, it is doubtful whether the building can be constructed and finished in accordance with the plans. However, construction will be started and as much as possible completed. The minor school building construction in the hands of the district engineer is also undertaken on this basis, the very small appropriation available for these projects making their completion possible only by the use of gratuitous labor working under a head carpenter designated by this office and by the donation of materials by the townships concerned.

The work on the Murong Irrigation Canal is progressing very rapidly. There are nearly 200 Ifugao laborers working every day. The canal is to be 4 meters wide at the bottom with a side slope of 2 to 1. The laborers are paid at the rate of ₱0.40 per day, plus 25 centavos worth of rations per day. The rainy season may compel the stopping of the work at any time. It is estimated that for the months of July and August the cost per cubic meter of excavation varied from 85 to 90 centavos, one-third of which, accounts for the rations furnished. Sixty per cent of the work is completed.

The Villaverde trail leads to the Pangasinan boundary and is the only outlet to the south. It is kept open all the time. At the beginning of last dry season, a great deal of work was undertaken with a full force of men and the trail was put in excellent shape. There is now very little money left to keep the trail open for the rest of the year.

OCCIDENTAL NEGROS.—In spite of all the difficult conditions during the long period of its construction, the reinforced concrete overflow bridge across the Imbang River on the Silay–Guimbalaon Road was at last finished on July 20, 1918. The construction of this long bridge was begun on April 24, 1916. After half of it was completed several big floods passed and washed away nearly the whole finished portion, leaving only a five meter length concrete slab at the middle of the river. Several attempts were made to start the job again during 1916, but without success. Finally, it was decided to close the job and carefully study the behavior of the stream under the frequent floods. During 1917, it was found that after every flood the west bank was being scoured while the river changed its course. Five jetties of big boulders were then placed on both banks and observations were made for several months. It was found that these jetties prevented further erosion of the banks and that the stream no longer changed its course. Considering the above facts, construction was again started in March, 1918, and continued to completion to the great satisfaction of the people of the province. The total expenditure on the bridge was nearly ₱30,000. It has a total length of 185 lineal meters, with a total width of 15 meters, of which the clear road way is 5 meters. The upstream slope is 1 meter long while the downstream slope is 3 meters and the apron 6 meters. The ordinary flow is taken care of by 12 pipes, each of which is 50 centimeters in diameter.

Imbang protection work over the Imbang River, Silay-Guimbalaon Road, Occidental Negros.

Due to the favorable impression created by this structure, the influential hacenderos of La Carlota have promised to make voluntary contributions for the immediate completion of the proposed overflow section across the Hinuban River, La Granja–La Castellana Road. Construction of the latter was started early in August and is expected to be finished before the 15 of October, 1918. The plan for the Najalin overflow, with some modifications as to the apron and the number of pipes, is being followed for the Hinuban construction. It is estimated that the total cost of this bridge will be about ₱2,000.

For the second time, the Camanug skewed girder bridge on the Bacolod–South Road was advertised for bids. The contract was awarded to Mr. Monico Puentevella, of Bacolod, for ₱6,696, time 75 calendar days.

The Bacolod double tienda is nearing completion. The plan was modified to provide better ventilation. This ventilation device has been tried on the La Carlota market tienda and is found to be satisfactory in regard to the supply of cool air inside of the tienda.

The Bago market building, a special type 12 by 24 meters, was finished in August. The work was undertaken by Mr. Monico Puentevella, under a contract of ₱2,990, time 90 days. All materials used on this building were taken from the old municipal building, which has been replaced by a new concrete one. The contract for constructing a special type tienda, 17.1 by 4.1 meters to be built out of the remaining materials from the old Bago Presidencia, was awarded to Mr. Monico Puentevella for ₱800, time 75 days.

Repairs on the Maluge collapsible bridge on the Saravia–Victorias Road, the protection for the Imbang Bridge, Silay–Saravia Road and the protection for the future Binalbagan Bridge, Hinigaran–Isabela Road have progressed rapidly.

Imbang overflow bridge on the Silay–Guimbalaon Road, Occidental Negros.

Since June, 1918, the well rigs in the province have drilled 12 artesian wells. Seven of these were drilled in the municipality of Talisay, two in the municipality of Kabankalan and three in the municipality of Bacolod. The first well drilled in Bacolod is located at the center of the Bacolod market site. Over this well, a galvanized iron water tank of 1,000 gallon capacity was built. From this tank, pipe lines were laid to supply water to the two sinks in the present market building.

During the past quarter, nearly 15 kilometers of first-class roads have been finished, seven of these on the Talisay–Concepcion Road, two on the Binicuil–Kabankalan Road, three on the Valladolid–San Enrique and three on the Cadiz–Manapla Road.

Surfacing on the Manapla–Cadiz Road has been going on rapidly and it is expected that if the same rate can be maintained by the end of October, 1918, the whole road, with the exception of a 2 kilometer section will be in the first-class condition. Subgrading on the Cadiz–Fabrica (Faraon) Road was begun early last August, and at the present time a little more than 2 kilometers has been finished.

Due to lack of funds, the Talisay–Concepcion and the Eustaquio–Lopez Nacayao Road projects were closed late in August, 1918.

Work on the Bacolod–Murcia Road with respect to hauling of gravel has been pushed rapidly with the help of some influential hacenderos who are interested in that road. Surfacing work will be started on this road in September.

Hinuban overflow bridge under construction, Occidental Negros.

Surfacing work on the Valladolid–San Enrique Road has progressed rapidly. With the help of the two government Ford trucks which arrived recently in the province, gravel from Lagasan River is being hauled quickly, and at a lesser cost than before, to the site of the work. As soon as surfacing on this road is finished, rolling on the Hinigaran–Paticui Road will be started.

Subgrade work on the Caridad–Sagasa Road has already been finished. Due to the fact that this year's appropriation for this road was only enough for the subgrade work, the project has been closed and will be reopened next year, when money for the surfacing work will be available.

The gang system of the maintenance on first-class road has been found to be unsatisfactory and, therefore, early in August, 1918, the caminero system was again introduced on all first-class roads in the province. The caminero system will be used on first-class roads only, while the gang system will be continued on the maintenance of the second class roads.

ORIENTAL NEGROS.—Due to the bad condition of the first–class road between Ayuquitan Nuevo and Ayuquitan Viejo resurfacing is being done. About 2½ kilometers have already been resurfaced. The work is still in progress. Additional pipe culverts were constructed to properly care for storm water drainage.

About 5 kilometers of the subgrade of the Dumaguete–North Road has been finished. The first and second course stone for kilometers 53 to 56 inclusive has been placed and rolled. Metalling is still progressing, but rather slowly, due to the heavy rainfall in that section. On the section between Guijulñgan and Libertad, a subgrade about 2½ kilometers long has already been completed.

Along the Dumaguete–South Road, the section between Dumaguete and Bacong has been finished. In this section, there are two creeks and one river over which temporary wooden bridges will be built as soon as funds can be secured.

Work is still under way on the Dumaguete–Luzuriaga Road. About 3 kilometers has been completed. It is probable that by the middle of November the whole road to Luzuriaga will be completed; for broken stone for the second course has already been spread.

The Intermediate school building in Siaton is now under construction. Materials from Dumaguete to Siaton are being delivered by sacayan.

The construction of the municipal building of Jimalalud has been started. The delay on this project was due to the difficulty of transporting materials.

On the Island of Siquijor, due to lack of funds, no construction was accomplished during this last quarter. The only work there is the maintaining of the first and second-class roads.

PAMPANGA.—The construction of the Magalan farm school at Magalan has been advertised for bids. It will consist of 6 buildings; one academic building, one mess hall, two teachers' houses, one shop and storeroom; all of mixed materials.

This office is making a plan for a pontoon bridge over the Pampanga River at Candaba. As soon as the plan is finished it will be submitted to the Bureau for approval. It will consist of ten sections; each section to consist of four bancas, each of which has a carrying capacity of ½ ton. Each section will be attached to the cable separately by chain and can be removed independently; thus in case of extreme flood, each section can be removed with ease and great rapidity.

Road construction from Mexico to Tarlac boundary will be completed by the middle of October, 1918; it has a total length of 24 kilometers.

Road construction from Lubao to Bataan boundary is progressing slowly due to rainy weather, however, an effort will be made to surface the remaining 7 kilometers of finished subgrade before the end of the year.

The 9 kilometers of subgrade from San Antonio to Floridablanca have been waiting for the road roller. Metalling for the first course has all been delivered and placed along the road side. It is expected to push the work next month.

Work on the Mabalacat Presidencia has been started. The building is of reinforced concrete, and of the one story type.

The asphalted spillway on the Macabebe road proved a failure. It is contemplated to construct a concrete spillway in its place.

Guagua market building is 95 per cent completed.

The municipality of Angeles has asked for a loan of ₱8,000 from the Philippine National Bank, to complete the first 10-rooms of the standard Plan No. 20 school.

Flowing well at San Fabian, Pangasinan.

PANGASINAN.—The construction of Alaminos–Bani, Alaminos–Lucap, San Jacinto–San Fabian, San Fabian–Mañgaldan, Malasiqui–Santa Barbara, San Carlos–Binmaley and Mañgatarem–Urbiztondo roads has been temporarily suspended, due to excessive rainfall.

The provincial boulevard around the capitol has been completed with the exception of the 1½ kilometer section leading to the town.

The provincial capitol building, which is estimated to cost ₱370,000, has been completed, with the exception of some minor works such as painting, some partitions and part of the terrace wall which surrounds it. The project will be completed by the end of October.

The Malasiqui Presidencia, of the Pasig type, estimated at ₱25,000 is nearly completed. All the concrete walls and floors have been finished, leaving unfinished only the roof and partitions.

The Santa Maria and San Manuel school buildings, standard plan No. 6, are now ready to be started.

The Mapandan Presidencia building repairs will be completed during this month.

The reconstruction of San Fabian school is already completed and the reconstruction of the presidencia in the same town is progressing rapidly.

The installation of the electric plant of Lingayen to light the massive capitol of Pangasinan and the city, and the private houses is progressing very rapidly.

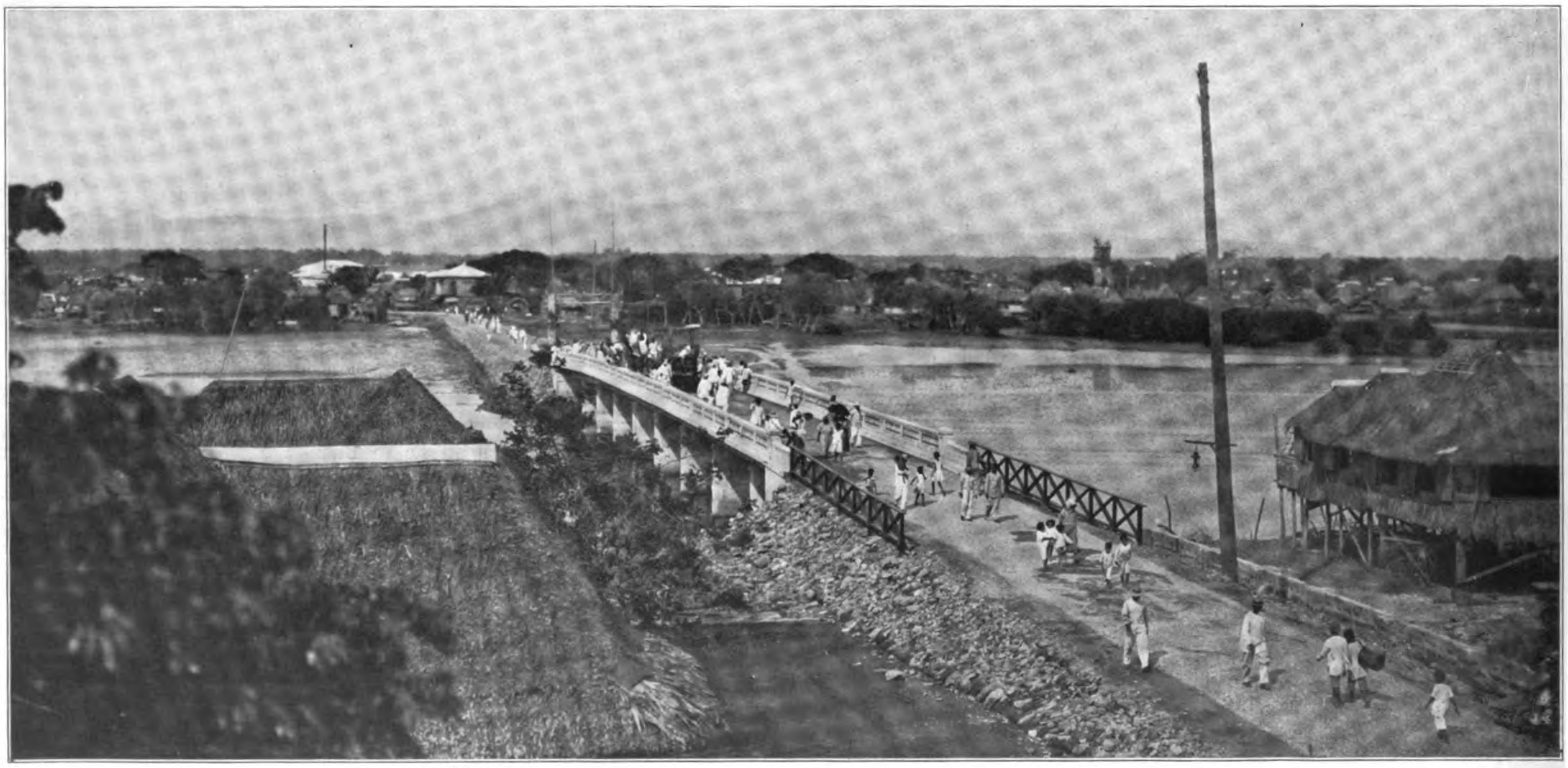
RIZAL.—The construction of a telephone line from Las Piñas to the municipality of Munting Lupa and the Alabang Stock farm has been started. Owing to the small amount of funds available for this project, bamboo poles are being used.

The Malabon–Navotas bridge, consisting of nine, 9-meter girder spans, on reinforced concrete pile foundations, is now completed and was opened to traffic on August 3, 1918.

The timber trestle bridge between McKinley and Pateros is nearing completion. The provincial board has allowed the contractor to substitute Oregon Pine for yacal in the superstructure of the bridge, thus reducing the original contract price from ₱5,980 to ₱5,500.

Resurfacing on the Makati–Santa Ana Road has begun and over 2 kilometers have now been completed. On account of quarantine at the barrio of Tejeros and lack of bullcart transportation, the use of Los Baños stone was abandoned and Rizal quarry stone was employed instead.

Construction was started on the Taguig 6-room school building about the middle of July. Concrete work will be finished by October 15 and it is expected to complete the building early in November. This work is being carried on by administration.



Panoramic view of the Malabon–Navotas Bridge from the tower of Navotas Church, Rizal.

Testing capacity of Artesian well at Parañaque, Rizal.

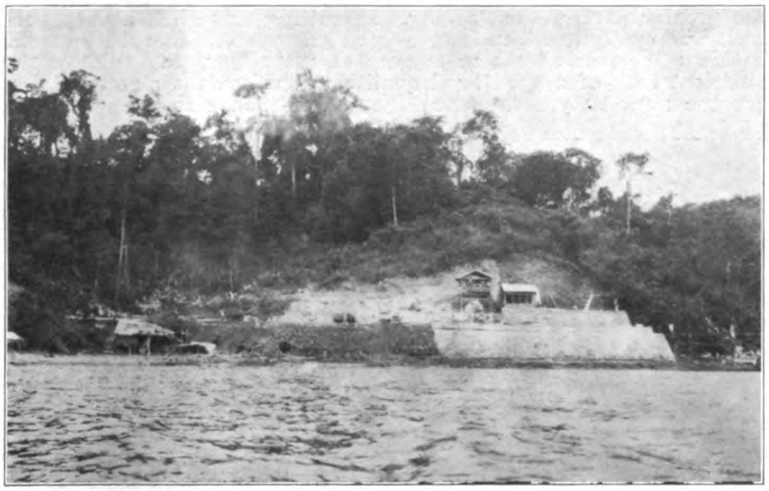
ROMBLON.—Due to the high labor rate, it is impracticable to do any work in this province. The minimum unskilled labor rate is ₱1 per day.

The only work going on is the opening up of all trails for horseback traffic. The road construction projects are all pending, due to lack of labor.

The Romblon water works and the Romblon Dock projects are under investigation. No work will be done until plans are approved by the Central Office.

SAMAR.—During the past quarter, five out of six road construction projects were stopped due to exhaustion of funds. The only active project is the Catbalogan–North Road. This is a subgrade construction under contract, and only 1 kilometer is left to completion.

During August the Maulong Quarry was put into operation and sufficient rock was crushed to surface the 680 meters of connecting road between the quarry and the provincial road. The crusher is now idle because of lack of funds.

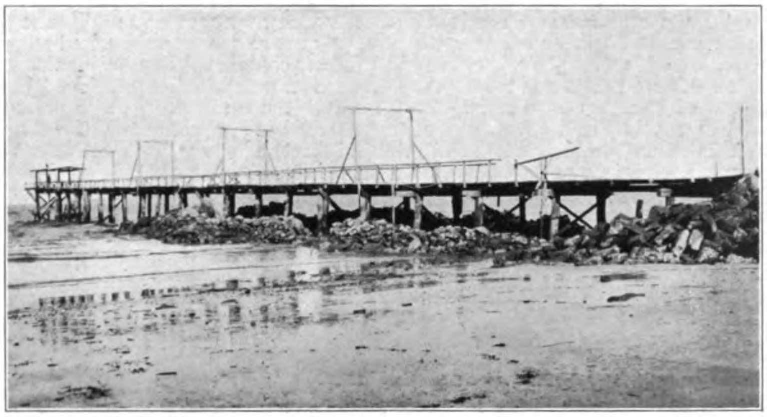


View of the Maulong Quarry, Samar.

The Basey school building, Bureau of Education Standard Plan No. 10, was finished on August 21, 1918. Work on the Guiuan school of the same plan has not yet begun, due to delay in the shipment of tiles. Between 40 and 60 per cent of the tiles were broken when ready for shipment.

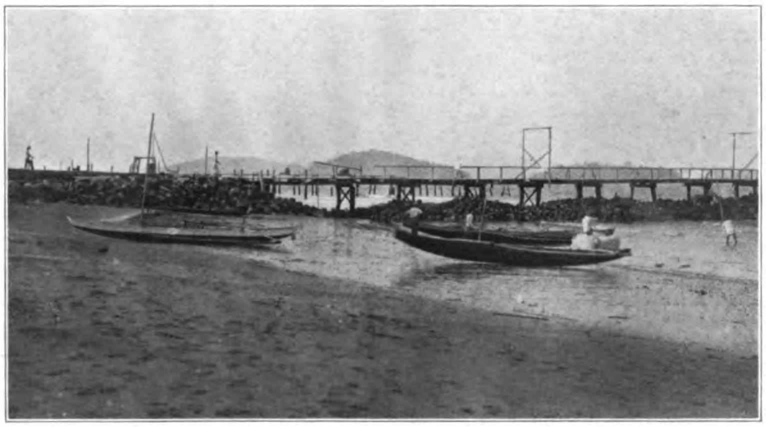
The extension of the Calbayog River Wall was started on August 26. This is a municipal project, for which ₱6,000 is available.

Work started on August 17 on the Catbalogan Causeway for which an Insular appropriation of ₱50,000 is available. The causeway is a rock fill faced with two-man coraline limestone rock placed on a 1 to 1 slope. Its top width is 8 meters and the elevation of the roadway is 3.50 meters above average low water. When completed it will extend 350 meters into the sea and have a 100-meter cross pier at its extremity. A 30-meter opening is to be left at a distance of 50 meters from the shore to allow for the free passage of the current of the Catbalogan River which empties into the sea about 400 meters from the causeway. This opening will be bridged with a concrete deck bridge. The causeway will extend out to sea sufficiently to give a depth of 6 meters at low tide, allowing the largest boats calling at Catbalogan to anchor alongside.



View of work on Catbalogan Causeway, Samar.

The contractor, F. G. York, of Cebu, receives ₱5 a cubic meter for coral rock fill and ₱9 a meter for the coraline limestone facing rock. His equipment consists of the 85-foot Bureau of Public Works launch Siasi; four flat decked scows of from 80 to 100 tons capacity; one derrick scow and one small ships dory launch. Thirty-five barotos are used to assist in bringing in the rock fill, but can be used only in good weather. The derrick scow transports the large facing stone weighing from ⅛ ton to 1½ tons a distance of 5 to 10 miles. The rock fill is brought from a distance of from 4 to 7 miles. All work is suspended during rough weather which is quite prevalent during this monsoon. During August 471 cubic meters of rock fill were delivered by the contractor with only four full working days. During September 3,277 cubic meters of rock fill and 105 cubic meters of facing rock were delivered. At the present rate, the appropriation will be exhausted by November. About 150 lineal meters of causeway will have been completed.



View of work on Catbalogan Causeway, Samar.

SORSOGON.—The past quarter has seen good weather generally throughout the province and good progress has been made on all projects. Three kilometers on the Sorsogon–Bacon Road have been resurfaced and the entire section is now in excellent condition. Kilometers 3, 4, 5, 6, and 9 on the Sorsogon–Gubat Road have been resurfaced and it is hoped that the remaining kilometers will stand up during the remainder of the year. The balance of the road should be resurfaced next year if there are sufficient funds.

Grading on the Sorsogon–Albay Road has been finished to kilometer 15 and surfacing completed to kilometer 11. There are sufficient funds to surface 2 more kilometers, which will bring the road to the barrio of Tublijon.

Repairs to the provincial High School have been continued and the two ends are now in first-class shape. It is hoped the province will have sufficient funds during the coming year to finish the repairs on this structure.

SULU.—Construction and reconstruction of the Jolo–Maimbung Road has been discontinued on account of lack of funds. There are about 300 cubic meters of crushed hard rock on hand at the side of the road, ready to be placed when more funds are available, which will not be before the beginning of the new year. There are also 1,032 meters ready for crusher placed at road side in various places along the road which will be crushed and placed as soon as funds are available. Two hard-rock quarries have been located on this road; one at kilometer 4 and the other at kilometer 7. The quarry at kilometer 7 can be used to good advantage on 3 roads: Maimbung, Siet Lake and Parang roads, being situated at about equal distances from each. It is hoped that these two quarries can be worked very extensively next year. There has been considerable new location work done on this road, but very little construction accomplished because of shortage of funds. This road is the main traffic artery out of the capital, and there are some rather heavy grades, on the first 7 kilometers, which will be eliminated in the new construction. At present, efforts are being made to keep it in shape until the province is able to appropriate more money, or until more Insular aid is made available.

This road should have a 7-meter subgrade with a 5-meter surface for at least 7.5 kilometers from Jolo, where the traffic splits three ways, at which point the subgrades and surfaces can be reduced and still take care of traffic.

According to a letter from the Department Governor and Department Engineer in regard to installing light railways in the Department in the near future, and using the present road system where possible, there will have to be considerable relocation work done, in order to eliminate the heavy grades which obtain at present.

Construction has been stopped on the Siet Lake Road for lack of funds. This work was under contract on the percentage plan, which worked out pretty well, the contractor having no trouble keeping laborers, as he paid them once a week, and advanced them a small amount between pay days.

Thompson's Tractor. After hauling telephone poles—Jolo–Seit Lake Road Construction at kilometer 15, Sulu.

Three kilometers of subgrade have been finished, from kilometer 12.5 to 15.5. This grade is 7 meters wide with the exception of about half a kilometer which was made 5 meters wide, on account of heavy cuts and fills. All of the subgrade has been rolled and backfilled, and can be used for light traffic. This work cost ₱4,529 per kilometer for subgrade with 6 Armco culverts in place. Total cost ₱13,587.05. This excessive cost was due to heavy cuts and fills and the cost of crops and fruit trees destroyed in straightening out the alignment.

On the Jolo–Parang Road, ¾ kilometer of additional subgrade has been built this year, and 2 kilometers of hard rock surfacing applied. Work stopped for lack of funds. There were 3 new culverts constructed this year on this road. Two 2-meter rubble stone arches and one 2.5 by 1.0 reinforced concrete box concrete. Also, one 6-meter bridge with rubble abutments and timber deck. Total cost of this work with one bridge and one reinforced concrete box culvert was ₱14,180.45. There will be nothing more done on this road this year, except some relocating, leveling and cross sections in order to get the exact cost of work accomplished when work starts the beginning of the year. There are on this road ready for crushing 1,000 cubic meters of good hard rock, crusher size, already mined.

Finished Road. Indanan-Parang Road kilometer 12–800, Sulu.

Ditch on Calle Cementerio to divert from Military Reservation to Hasaan Creek to prevent flooding the City, Sulu.

Work on the maintenance and upkeep of public highways and ferries is going on nicely. A deep ditch has been dug on the east side of the town to take care of floods during the rainy season. These floods collect from a large water shed on the Military Reservation and flow through a swale into the town. The streets were covered with 2 feet of water during a hard rain. By cutting this ditch and throwing a small dam across the swale it was possible to eliminate the greater part of the flooding. In cutting this ditch a very good rock was encountered, making a good quarry for the road material within 200 yards of the main gate of the city, which will provide sufficient rock of a good hard quality to surface the streets of Jolo for the next 10 years. When the writer took charge on July 22,

Calle Arolas, under construction, Sulu.

1918, there was available only about ₱2,800 for street maintenance in Jolo, and the streets were in bad condition. The streets have since then been kept clean. The cost averaged about ₱435 per month for this work making a total of ₱1,305 to date. In addition to this the drainage ditch was dug and 3,010 square meters of streets were reconstructed. The expenditures for cleaning, surfacing, and ditching the city streets up to July were about ₱6,926.22. An additional appropriation of ₱6,000 was made, which with the balance available, makes a total of ₱15,726 for the year. Out of this there is set aside ₱1,740 for street cleaning for the rest of the year, so even if there is no additional appropriation the city can be kept clean. Although this office has been assured by the municipal officials that there will be more funds appropriated for street work this year, there is some considerably expensive street work to do, especially in the Tulay section, which lays in a swamp, with streets below high tide; and where the street grade must be raised in some places as much as 75 centimeters, with material hard to get and consequently abnormally high, and transportation very expensive, it is evident that the cost will be unusually high.

Resurfacing Jolo Street, Sulu.

An appropriation of ₱13,761.46 is available for the construction of the Jolo Wharf. This is an Insular project. Work is in progress. There is considerable new under piling to change but there are not enough piles on hand to finish this part of the work at present. Fifty Liusin piles were ordered; 30 of them have been delivered and the remaining 20 are just waiting transportation. As there is no boat running in the southern islands sufficiently large to carry timber of that size and length, except the tie boats hauling ties for the Sibutu Lumber Company, and as they only take extra cargo in case they have not sufficient ties to load their boats, it is difficult to predict when the remaining 20 piles will be delivered.

Transportation in this province is very difficult. Inasmuch as the province is scattered all over the Sulu Sea, and the district office has no launch or scow for transportation at its disposal, it is difficult to move any materials, or inspect the work. There are some more piles ordered for docks, but cannot be secured because of the scarcity of transportation. There is on the island of Jolo a teak timber, that has proved to be a very good material for piling. There were piles laying in the bay for 18 months, that were not damaged in the least, while along side of them Liusin piles that had been in the sea only one year were badly eaten by toredos.

No work has been done on the repair of Siasi and Bongao docks. A contract for timber and piles for Bongao has been let, but the materials have not been delivered yet. As for Siasi, work will be started as soon as the material is transported to the site.

Borings at the Jolo dock site are in progress now, in order to get data for future development work.

The following are the school buildings under construction:

1. Lugus, 1 room timber.
2. North Ubian, 1 room timber.
3. Culay Culay, 1 room timber.
4. Taglibi, 2 room stone rubble.
5. Tulayan, 2 room timber.

The construction of all these buildings was contracted, but the outlaws got busy in various places and scared the contractor out. Soldiers were not available for guards, so this office had to build them by administration.

Another thing that held the work up was under-estimating, causing the suspension of the work for lack of funds. A new appropriation has been made available sufficient to complete four of the five school buildings now under construction. The fifth, being a stone building, will require a separate allotment, as it was changed from a timber structure to a rubble permanent building, making it cost about three times the original appropriation.

Transportation is holding up the construction. The School Department has agreed to furnish ₱3,000 for the construction of a lorcha this next year, but there is no launch available at present to tow it with. All of the launches are kept busy by the provincial government in their administrative work. The School Department has one but it is busy all the time visiting the outlying schools. This office will have to be provided with adequate transportation in order to execute work in the outlying sections.

The total cost of the pending school projects is roughly estimated at ₱75,000. Teachers' Cottages are proposed for construction at Tonguil, Tugas, Parang, Maimbung, Pansul and Taglibi. The total cost is estimated at ₱21,000.

The construction of the distributing system of the Jolo water works involves the wrecking of the Gandasulig Water System, which was abandoned in favor of the Military Water System, constructed by the Military and paid for by the province.

All pipe lines on the Gandasulig System have been salvaged, part of this pipe being used in the new system.

719 meters 7 inch-steel pipe,
459 meters 6 inch-galvanized iron,
37 meters 6 inch-concrete beam,
518 meters 8 inch-concrete beam,
1,164 meters 4 inch-concrete pipe,
200 meters 5 inch-galvanized iron,
250 meters 3 inch-galvanized iron were used in the new system,
212 house connections made, and
188 meters installed,

leaving 25 meters to be installed. The 25 meters have been ordered but not yet received.

This work cost, for labor, including surcharges, roughly about ₱7,275.80. Labor incurred in wrecking the Gandasulig Water System including transportation of rams and pipe from the wrecked system is included in the ₱7,275.80. An additional appropriation of ₱4,000 is made available by the municipality for this project.

The city has plenty of water at all times now, something it has never had before and everybody is satisfied. The static pressure is 40 pounds per square inch. Water is taken from springs in Asturias by gravity and delivered to a sump at pumping plant. It is then pumped into the distributing system.

The following items salvaged from the old system are available for sale:

3 complete Hydraulic Rams,
1,368 feet 8 inch concrete beam pipe,
2,360 feet 7 inch steel pipe.
270 feet 12 inch steel drive pipe,
100 feet, more or less, 4 inch concrete beam pipe,
3 7-inch gate valves,
3 12-inch gate valves, and
1 6-inch gate vale flange.

This project is to be turned over to the municipality within a short time for operation, but by request of the presidente, and provincial governor, the engineer is to remain in charge, with a superintendent under him to look after the maintenance.

The maintenance of first-class roads is still underway but there is only a small amount left for this work. Funds for the maintenance of second-class roads are exhausted.

Funds for the maintenance of telephone lines are exhausted and the work has to stop. Five hundred poles have been ordered and are expected on the first boat from Sibutu.

The construction of a temporary market at Indanan is finished. It consists of wooden posts set in the ground with cement around them which support a truss roof frame, with nipa roofing. Cost ₱1,478.64.

There is an open court in center of the Jolo Custom House on the second story covered with cement. It has always given trouble by leaking. It has been covered with malthoid roofing which, it is believed, will solve the problem.

SURIGAO.—The Surigao–Placer–Mainit Road is the important work of this province. The work comprises relocation, regrading, and widening the present third-class road. The surfacing on kilometers 14 and 15 has been completed, and the road roller is operating on kilometer 16. Grading is heavy at kilometer 17. The hauling of gravel at kilometer 25 has been started to protect the sub-grade before the rainy season begins. The prevailing good weather and the force of seventy Cebuano contracted laborers did the work rapidly and efficiently, in spite of the labor problem which is still a source of annoyance. The appropriaton for this project was ₱58,594.93 this year, and the balance on August 31, 1918, was ₱18,591.

The materials for the Bilangbilang Road improvements on the port area are now prepared, and the work will be started soon.

Several galvanized iron pipe culverts have been constructed on the Surigao–Placer Road. The timber temporary bridge of 4–6 meter spans at Anahaw River, kilometer 11.2, is nearly completed and will be roofed with nipa. A similar temporary bridge at Hinagsaan River, kilometer 17, will be started soon, piles of mancono being obtainable at the site. First and second group timber for the sub and superstructure will be obtained in the vicinity, and hardware has been ordered from Manila.

The Placer water supply is a gravity system for which an appropriation of ₱8,000 and ₱4,400, Insular and municipal funds, respectively, has been made. The money is in the hands of the provincial treasurer. The materials are to be requisitioned. Gravity systems are proposed for Lianga and Gigaquit. Both are waiting the deposit of the required municipal funds.

The work done on the repair and alteration of Constabulary buildings has been confined to the provincial commander's residence and the Constabulary Barracks. The first is partially completed, only important parts have been repaired, due to lack of funds. The latter will soon be completed.

The present telephone line reaches the municipality of Placer. One telephone apparatus is located in the office of the municipal treasurer to connect with the provincial capital.

TARLAC.—During the last quarter most of the public works in this province have been either suspended, or slow progress was made, due to heavy rains, accompanied by severe floods, and the shortage of laborers.

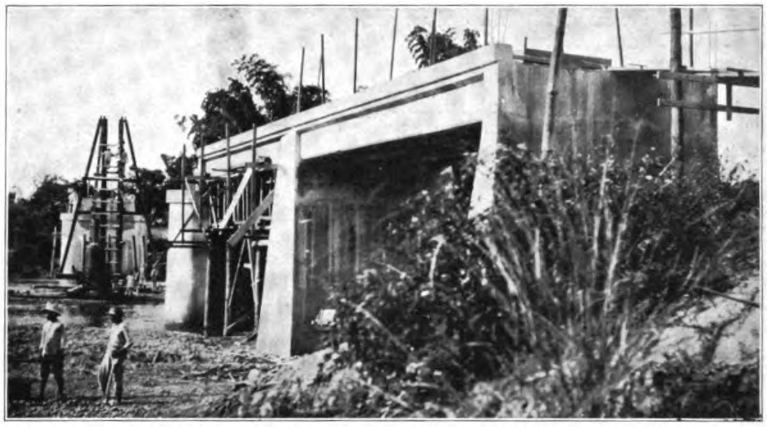
Part of the Manila North Road thru the business section of Tarlac.

The construction of Gerona–Pura Road has been completed during the past quarter.

The construction of Tarlac–Murcia Road is now well under way and it is expected that before the end of this year this project will be completed.

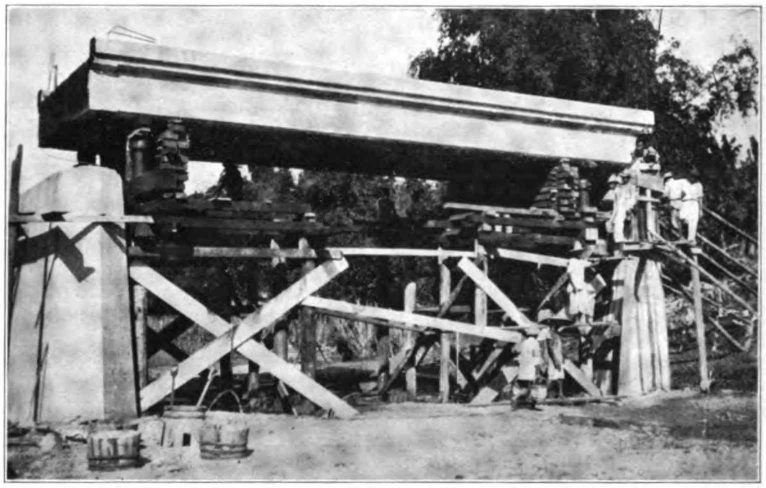
Although very little progress was made on the construction of Tarlac–La Paz Road, it is hoped that this road will be completed during the month of October, as there is less than 200 lineal meters of road to finish.

About one third of the surfacing materials and 75 per cent of the materials for the construction of the seven wooden bridges of the Concepcion–Magalang Road are now available.



East view of Santiago bridge, taken September 24, 1918, showing the 12-meter span slab and girder after being raised one meter higher and false works removed. Tarlac.

The progress of the construction of Santiago bridge has been greatly retarded due to the unprecedented heavy rains and floods which his this section of the country, and which necessitated a great many changes in its construction. All the abutments and piers which were already finished up to the bridge seat, including one 12-meter span slab and girder, which was already in place before the flood of July 12 last, were raised one meter higher than the previous elevation designed. One novel feature in connection with the work on this bridge was the raising of the 12-meter slab and girder span, weighing about 56 tons, after having been in place for about a month. Six hydraulic jacks and two screw jacks placed on false work, as shown in the accompanying pictures, were used to raise this span to the proper elevation and the piers and abutment were concreted up to the bridge seat and allowed to set for 14 days before the span was lowered and the false work removed.



South view of the 12-meter slab and girder span on Santiago bridge while being lifted one meter higher than the original elevation of bridge seat. Note the false works and the hydraulic jacks in place.

TAYABAS.—Road maintenance during the quarter has become a serious problem due to lack of suitable materials. The 5-ton White truck, which was expected to do most of the hauling of crushed stone to supply the needs of the camineros, was idle during the quarter due to lack of gasoline. No resurfacing was accomplished during the quarter, except the application of sand top-dressing to the Tayabas–Lucban Road. Seven bullcarts have been hauling crushed stone from the Iyam Quarry to kilometers 133 and 134 of the Lucena–Sariaya section to be used for resurfacing. Progress was, however, very slow as bull carts can only make two trips a day. About 1,000 cubic meters of crushed stone at Iyam Quarry is now in readiness for hauling to the road. The furnishing of hand broken stones for resurfacing the Lucena–Tayabas section has been advertised, as this section cannot expect to receive crushed stones from the Iyam Quarry due to lack of transportation facilities. To partly solve the problem of the transportation difficulties for road maintenance materials, ten pairs of wheels have been requisitioned, which are now being fitted with bodies. These ten carts in addition to the three already owned by the province will be hitched to the road roller for hauling crushed stone.

Crushing has been stopped at Iyam, as the engine and crusher are being moved to Sariaya. The Sariaya Quarry will be located near the Sariaya River at kilometer 125 of the Sariaya–Candelaria Road. It is contemplated to keep the crusher at this point long enough to prepare the necessary materials for the maintenance of the roads around Sariaya, then it will be moved to Palsabañgon to be incorporated with the crusher now being installed there. It is expected that, with the two crushers working at Palsabañgon, there will be no trouble in keeping the roads well maintained in the future in Tayabas Province.

Candelaria Bridge was opened to traffic during the latter part of the quarter. After one month of exposure to the weather, the wooden members of the trusses were given three coats of paint.

Only one kilometer and a half of surfacing on kilometers 50 and 51 (old numbering) remains to be done on the Atimonan–Siain Road. Had it not been for the delay of four days caused by the repair of the road roller, the entire road would have been completed at the end of the quarter, with the exception of the four box culverts. The construction of these four culverts will not be undertaken this year due to lack of funds. However, temporary coconut-logs structures have been installed capable of carrying the road roller. It is expected that the entire section of the road from Atimonan to Siain will be opened to all kinds of traffic before the middle of October. As soon as this road is completed, the roadroller will be moved to Lucban to work on the construction of the Lucban–Mauban Road.

The subgrade work is now completed up to and including kilometer 7, the zero station being at Lucban, of the Lucban–Mauban Road. As the road is continually open to traffic, the subgrade has compacted sufficiently to allow the placing of the surfacing materials as fast as broken stone can be furnished. Broken stone has been spread up to and including kilometer 3. In order to confine the traffic to the surfacing, sand has been spread over the center portion of the surfacing to a width of about 1.5 meters. The section already surfaced has so well compacted that an automobile can go over it at any time. The paquiao system of constructing the subgrade has so well worked out that, in the future, all subgrade will be done under this system. The surveyman is now busy running the line at Bitocangmanoc in order to give work to the paquiao men who are clamoring for more work, as in the course of a week the subgrade on kilometer 8 will be completed.

Fair progress is being made on the construction of the Sariaya–Bucal Road. Only one-half kilometer of subgrade work remains to be done. Broken stone has been spread over 400 lineal meters, and hand broken stone has already been deposited along the shoulders of 3 kilometers. Concrete pipes are being cast at the sites for the culverts to be constructed on this road.

The entire 2.5 kilometers of subgrade of the road to Lutucan Railroad station has been completed. Broken stone has been deposited and prepared along 500 lineal meters of this road. Concrete pipes are being cast at the sites for culverts.

The repairs to the Tiaong–Dolores Road are progressing satisfactorily. Five kilometers of subgrade has been completed and about five hundred lineal meters of surfacing spread. Every effort is being made to surface those sections which are likely to get muddy during the rainy season.

The repairs to the Tayabas–Sambat Road progressed rather slowly. Four kilometers of this road on the Tayabas end have been graded and provided with proper drainage. All the muddy places on this road have been repaired. Attention is now being devoted to the surfacing, in an effort to make it smooth, thereby making travel easier over this road.

The construction of the municipal street of Pagbilao from the poblacion to the railroad station progressed very satisfactorily. All the grading work is completed now. The balance of the appropriation will be used for the temporary structures to span two culvert-openings, and for surfacing the street.

The construction of the municipal streets of Sariaya for which an appropriation of ₱8,000 has been made available, has been re-advertised. Two bids were received, one of which is advantageous to the municipality. If the recommendation of the district engineer is approved, the construction will start early in the ensuing quarter, under the direction of this office.

The construction of the Baler Domestic Science school building has been completed. Part of the balance of the appropriation for this project has been used to fence the school grounds and also to make 150 school desks.

With the exception of the grading, and placing the flooring and gutters, the Lopez market building is now completed. Grading has been started, but due to shortage of labor progress will be very slow. Additional funds in the amount of ₱1,250 have been provided. Every effort will be made to complete the building with the money available.

Erection of the Tayabas Domestic Science school building has not been started, due to non-arrival of the posts. All carpentry work, however, have been done, so that, when the posts arrive, erection will be very rapid.

Instead of constructing a Domestic Science school building, the municipal council of Sariaya and the division superintendent of schools have decided to add two more rooms to the present school building, Standard Plan No. 7. Plans, and estimates have been made, and as soon as the necessary funds are made available and the proper authority given, construction will be undertaken.

Materials are now beginning to arrive for the construction of the Lucena–Tayabas water works system. Actual construction will probably begin about the middle of the ensuing quarter. A resurvey of the line from Tayabas to the springs together with the surveys of the reservoir sites have been completed. Considerable difficulty was encountered in this survey due to inclement weather, lack of labor and difficulty of the line proposed.

A measuring weir has been installed at the Aliguayan Springs to determine the quantity of water. These Springs are the sources of the proposed water supply for the municipality of Lucban. Water sample has been forwarded to the Bureau of Science for chemical and bacteriological analysis.

MARINDUQUE SUB-PROVINCE.—Maintenance of the first-class road system has been carried on steadily during the quarter and as a result the roads are in good condition. Some resurfacing has been done on the Santa Cruz–Pantalan section.

The progress of the construction of the Mogpog–Balanacan Road was very slow due to lack of labor and the heavy work involved. The work is nearing Balanacan and the excavation varies from 3 to 6 meters in a soil varying from clay to adobe stone and hard rock. A foreman duly licensed to handle dynamite has been sent to this work.

Insular aid in the amount of ₱13,500 has been made available for the Santa Cruz water works system. Pipes for this system has been already reserved and requisitioned, and other materials will be ordered as soon as the central office furnishes the bill of additional materials. The total appropriation for this project is ₱20,250. Sample of the water from the source of supply has already been submitted to the Bureau of Science for analysis and the water has been reported satisfactory with regard to chemical properties.

Ihatub overflow section, New Boao, Marinduque.

The sum of ₱5,700, Insular aid for the Mogpog Water Works System has been made available. The job will be undertaken as soon as authority is received to commence work.

Funds for Boac River control have been exhausted. However, riprap has been placed at the ends of all three hurdles. Also the greater part of the river bank nearest the town, and between the hurdles, has been riprapped.

ZAMBALES.—The Subic–Castillejos Road is now finished except about 1½ kilometers on the Subic Hill. Plan and profile of the proposed diversion on this section has been submitted for approval. Formerly the Subic–Castillejos section was one of the worst parts of the Iba–South Road on account of its sticky clay subgrade and of the enormous traffic between San Narciso and Subic. Now the people of the southern part of the province are entirely satisfied with the section as completed.

Construction of the subgrade between Castillejos and San Marcelino has been continued. Due to the continuous rains and the fact that the work is out in the fields, very few laborers want to work. The rate of pay for common labor has been increased from 50 to 70 centavos to attract more laborers. The subgrade up to San Marcelino is expected to be finished by December.

The heavy and continuous rains in June, July, most of August and part of September, caused the rivers to rise to unprecedented heights and many parts of the road, especially between San Felipe and San Narciso, between the latter town and San Antonio, and between San Antonio and San Marcelino, have been flooded and some parts have been washed out, putting one bridge, the Sacatihan, in danger. But

Iba–South Road at kilometer 4, Zambales.

prompt action by the maintenance gang in preventing the river from cutting the road entirely, saved the bridge from isolation in the middle of the river. The maintenance gangs are busy repairing the worst parts and have managed to keep the road passable at all times.

Plans and profiles for the Botolan–Binuclutan section have been submitted for approval. It is expected to construct this section early next year.

In the north, a gang has been busy repairing the worst parts of the road, especially that part between San Lorenzo and Masinloc.

An allotment of ₱1,000 has been received for the investigation and survey of Subic–Bataan Boundary Road.

ZAMBOANGA.—One of the concrete abutments for the Manikaan bridge is completed above the water level. This abutment rests on 12-inch wooden piles driven to a depth of eight meters. One row on the stream side was driven on a batter. A standard pile driver was arranged to operate for vertical or batter driving and the same timbers for leads, and braces are used in both cases, bored for bolted connections in either position. Exellent hand sawed yacal is being delivered for the superstructure at the site for ₱80 per one thousand board feet.

Surveys have been completed for irrigation projects in the province involving over 2,000 hectares of rice field, approximately one half of which has no irrigation at all, and the other half only temropary and unreliable systems.

The macadam causeway to the dock has been given an asphaltic surface treatment. The No. 1 screening from the revolving screen of the rock crusher ranges from dust to ¾-inch, and ¾-inch material is too large for asphaltic surface treatment. To eliminate the necessity of re-screening by hand a No. 14 galvanized iron wire was woven through the holes of the screen to reduce the size of the opening. This arrangement worked quite satisfactorily.

Construction work has been started on a new building of the same type as the recently constructed General Hospital. This building will be divided into two general wards, a laboratory and administration offices.

Construction work on the Zamboanga Normal School is progressing rapidly. Every available carpenter is being used to finish the most elaborate ornamental door and window frames as fast as the concrete work progresses. The plumbing, water and soil pipes were set in the forms and the concrete cast around them, making a very neat job. All concrete work is now up above the first floor.

FINANCIAL.

LOANS FOR ROADS, BRIDGES, SCHOOLS, MARKETS, MUNICIPAL, AND PROVINCIAL BUILDINGS, WATER WORKS, ETC., FROM APRIL 1, 1918 TO SEPTEMBER 30, 1918.

Provinces and projects.	Act Nos.		Total.
	1729	1749	
Abra: New High School building	₱30,000		₱30,000
Antique: San Jose Waterworks		₱10,000	10,000
Cebu:			
Moalboal market	17,000		17,000
Toledo market		15,000	15,000
Leyte: Provincial building	100,000		100,000
Mountain Province: Tagudin market	13,000		13,000
Oriental Negros: Dumaguete waterworks		15,000	15,000
Pangasinan:			
Pozorrubio market		20,000	20,000
New provincial building and assisting in the installation of an electric light plant	75,000		75,000
Urdaneta market		25,000	25,000
Binalonan market		6,000	6,000
Rosales market		25,000	25,000
Samar: Wright market	15,800		15,800
Sorsogon: Sorsogon market		20,000	20,000
Tarlac: Tarlac municipal office	15,000		15,000
Tayabas: Tayabas waterworks system	26,000		26,000
Zamboanga: Zamboanga market		60,000	60,000
Total	291,800	196,000	487,800

APPENDIX A.

CIRCULAR LETTERS ISSUED BY THE CONSTRUCTING DIVISION FROM JULY 1, 1918 TO SEPTEMBER 30, 1918.

MANILA, P. I., *July, 24, 1918.*

Constructing Division Memorandum No. 11.

SIR: I have to invite your attention to the following Department Order No. 12 of the Department of the Interior, dated November 19, 1917, in relationship to tablets or name plates for bridges, buildings or other public works. This circular amends and supersedes all previous instructions issued.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS.
DEPARTMENT OF THE INTERIOR.

MANILA, *November 19, 1917.*

DEPARTMENT ORDER }
No. 12. }

Department Order No. 9 series of 1917, is hereby amended to read as follows:

Hereafter, provinces, chartered cities or municipalities desiring tablets or name plates for bridges, public buildings, or other public works, will make requisition on the Bureau of Public Works, giving the following information:

(*a*) Name of public work.
(*b*) Date of completion.
(*c*) If provincial project, names of members of provincial board and provincial treasurer; if city project, the names of the Mayor and members of the municipal board or of city council, or if municipal project, names of the municipal president, secretary, and treasurer, in office when work was commenced.
(*d*) Name of the district engineer with the prior approval of the Director of Public Works, or name of city engineer, as the case may be.
(*e*) Name of contractor, if any.

No names or information other than that above indicated will appear on the tablet or name plate, and no other tablet or name plate except the one containing the names or information mentioned above, will be attached to any public works, without the specific approval of the Secretary of the Interior.

Provincial Circular No. 67 of the Executive Bureau as amended by Provincial Circular No. 106 and Provincial Circular No. 126, is hereby repealed.

(Sgd.) RAFAEL PALMA,
Secretary of the Interior.

You are directed to familiarize yourself with the instructions contained therein, and carefully comply with same whenever you submit requisitions or requests for tablets or name plates for bridges, buildings or other public works in your district.

For the Director:

C. E. GORDON,
Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
DESIGNING DIVISION,
CONSULTING ARCHITECT,
CITY ENGINEER, BAGUIO, and
MR. JOSE DEL CASTILLO.

MANILA, *August 20, 1918.*

Constructing Division Memorandum No. 12.

SIR: I have to invite your attention to the following copy of a communication received from the Director of Census, dated August 14, 1918:

> "Pursuant to section 6–b of the Regulations Governing Census Organization of 1918, prescribed by the Governor-General, I have the honor to request that you advise the district engineer, or the person acting for him in each province, to coöperate with the Provincial Advisory Census Board in preparing a map of each province or subprovince showing the inspection and enumeration districts into which it is divided."

It is directed that the assistance therein requested be furnished.

For the Director:

C. E. GORDON,
Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
MR. JOSE DEL CASTILLO and
MR. R. H. TREASH.

MANILA, *September 5, 1918.*

Constructing Division Memorandum No. 13.

SUBJECT.—Explosives.

SIR:

1. Referring to Constructing Division Memorandum No. 10 dated May 23, 1918, it has been observed that many of the District Engineers have failed to comply with the instructions contained therein.
2. Hereafter, all requisitions for explosives must show the necessary authority for purchase and use of same (Purchaser's License number for Provincial Treasurer and Foreman's License number for District Engineers).
3. Requisitions for explosives which fail to comply will be returned to the requisitioners.

For the Director:

C. E. GORDON,
Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
MR. JOSE DEL CASTILLO and
MR. R. H. TREASH.

MANILA, *September 13, 1918.*

Constructing Division Memorandum No. 14.

SUBJECT: Materials for National Guard Cantonment.

Information has been received from the Adjutant General, Philippine National Guard, that the Bureau of Public Works will not be called upon to assist in securing materials for, nor in the construction of, the proposed National Guard Cantonment. Therefore, no further action need be taken by District Engineers in this matter.

For the Director:

C. E. GORDON,
Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
MR. JOSE DEL CASTILLO and
MR. R. H. TREASH.

MANILA, *September 16, 1918.*

Constructing Division Memorandum No. 15.

SUBJECT: School Building Construction.

SIR: At the request of the Director of Education, the construction of Manganese Oxide Blackboards in standard school buildings will be discontinued. Hereafter, provision will be made for the installation, including proper frames and chalks rails, of Hyloplate Blackboards, as furnished by the Bureau of Education, in all school building estimates and construction.

For the Director:

C. E. GORDON,
Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
CONSULTING ARCHITECT,
MR. JOSE DEL CASTILLO and
MR. R. H. TREASH.

MANILA, *September 20, 1918.*

Constructing Division Memorandum No. 16.

SUBJECT: Enlistment in the National Guard.

The attention of all employees of this Division is called to the following copy of a communication received from His Excellency, the Governor-General. on September 14th:

> *"To all Chiefs of Bureaus and Offices:*
>
> "I desire to impress upon you my sincere belief that the organization of a Division of National Guard that will be creditable to the Philippine Islands is the most important single project now confronting the Insular Government.

"The men most suitable for positions of trust and responsibility in that organization are either in the government service, educational institutions as students, or in positions of responsibility in other walks of life. The best in the Islands are not too good for this enterprise even at financial sacrifice on the part of individuals concerned.

"The Adjutant General of the National Guard will furnish you a memorandum as to the types of men required immediately for schools now in progress preparatory to mobilization of the Division early in November.

"I wish you to take a personal interest in this matter, explain the importance of it to your employees, and give it as much assistance as you can *give it* just short of disorganizing your bureaus or offices. A report of results obtained will be made to this office on September 30, 1918.

"The same spirit will be shown toward this enterprise where assistance is requested of the use of equipment of any kind."

The Constructing Division should be able to furnish a large number of well qualified men for the National Guard, particularly for those branches of the Service which require special training along clerical, mechanical and construction lines. All district engineers are directed to familiarize themselves with the requirements of the Guard and are expected to encourage enlistment, at the sacrifice of their district organizations, only short of complete disruption if necessary, to the end that the Bureau of Public Works shall have done its part in this momentous undertaking.

These instructions are issued with the full knowledge that temporary disruption of the district organizations may result. The occasion demands no less.

For the Director:

C. E. GORDON,

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
SUPERINTENDENT OF ARTESIAN WELLS,
MR. JOSE DEL CASTILLO and
MR. R. H. TREASH.

MANILA, *September 26, 1918.*

Constructing Division Memorandum No. 17.

SUBJECT: Enlistment of Employees.

Supplementary to Constructing Division Memorandum No. 16, dated September 20, 1918, there are forwarded herewith two model forms to be followed in case employees of the district offices apply for permission to enlist in the National Guard.

The Adjutant General, National Guard, P. I., has requested that these forms be adhered to. District Offices are expected to prepare such copies as they may require.

In accomplishing the form granting permission to enlist, the word "Temporary" will be substituted for Civil Service," in paragraph No. 2, when the applicant is not in the Classified Civil Service.

It will be noted that the activity of District Engineers need not be confined to encouraging the enlistment of employees alone, but should be extended to embrace every suitable candidate with whom they may come in contact.

Accomplished forms should be forwarded direct to the Adjutant General, Philippine National Guard, Manila, P. I., and this Bureau advised as to the names, positions, etc., of those who have applied for enlistment.

C. E. GORDON,
Acting Director of Public Works.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
MR. R. H. TREASH and
MR. JOSE DEL CASTILLO.

From:
To: *Adjutant General, National Guard.*
Subject: Mr. ....

1. Permission is granted above-named employee of this bureau or office to enlist in the National Guard.

2. He is a Civil Service employee and his salary is ₱.............. per month.

3. It is understood by this office that from the date of enlistment or from date he is called to duty until date of federalization of the Guard, the Civil Service salary of this employee will be paid by the National Guard.

....
Chief of Bureau or Office.

APPLICATION FOR ADMISSION IN SCHOOL.

I hereby apply for enlistment as a soldier in the National Guard for federal service and for admission into the School above indicated.

My special qualifications are..

....

I hereby certify that I am..............years old; that I am a citizen of the Philippine Islands; that I have never been expelled or dishonorably discharged from the Army, Navy, Philippine Scouts or Philippine Constabulary; that I have never been dismissed from the Civil Service; that I have never been convicted or sentenced for any crime.

All my military service is as follows, and my discharges are attached hereto: ....

....

....

....

....
Signature.

I hereby recommend the applicant as a man worthy of acceptance as a soldier. If I were commanding a company I would like to have him in the capacity of a..............................

Signature ....
Title ....
Address ....

MOTOR VEHICLES.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF COMMERCE AND COMMUNICATIOS,
BUREAU OF PUBLIC WORKS.

CIRCULAR NO. 20.

MANILA, P. I., *August 7, 1918.*

The attention of all bureau officers concerned is directed to the granting and issuing of licenses to owners of automobiles, who are considered public utilities, and strict compliance with the provisions of subsection (*i*) of section 16, and subsection (*h*) of section 17 of Act 2307, as amended by Act 2694, is requested.

These subsections read as follows:

"Sec. 16. * * * * * * *.

(*i*) No public utility as herein defined shall operate in the Philippine Islands without having first secured from the Commission a certificate to the effect that the operations of said public utility and the authorization to do business will promote the public interest in a proper and suitable manner. This provision shall not apply to any business at present being operated by the public utilities subject to the provisions of this Act."

"Sec. 17. No public utility as herein defined shall:

* * * * * * *

(*h*) Without the approval of the Public Utility Commission first had, sell, alienate, mortgage, encumber or lease its property, franchises, privileges or rights, or any part thereof, nor merge or consolidate its property, franchises, privileges or rights or any part thereof, with that of any other public utility as herein defined. The approval herein required shall be given, after notice to the public and after hearing the persons interested at a public hearing, if it be shown that there are just and reasonable grounds for making the sale, alienation, mortgage or encumbrance for liabilities of more than one year maturity, lease, merger, or consolidation to be approved, and that the same are not detrimental to the public interest, and in case of a sale, the date on which the same is to be consummated shall be fixed in the order of approval: *Provided, however*, That the sale, alienation, mortgage or encumbrance and lease of the property of public utilities which, on account of the nature and conditions of their business, are, in the judgment of the Commission, of little importance to the public interests, shall be exempt from the requisite of the approval of the Commission; but the public utilities shall in every case give notice of these transactions to the Commission. Any sale, alienation, mortgage or encumbrance, lease fusion or consolidation made without the approval herein required shall be null and void: *Provided, further*, That nothing herein contained shall be construed to prevent the sale, alienation or lease by any public utility as herein defined of any of its property in the ordinary course of its business."

In order to fully comply with the above, you are instructed to observe the following rules:

1. That hereafter no license shall be issued to owners of automobiles operating as public utilities unless they can show a certificate of the public convenience of their operation by the Public Utility Commission.

2. That no sales, alienations, mortgages, or encumbrances for

liabilities of more than one year maturity, lease, mergers, or consolidations be approved, unless the parties can justify that said alienations or encumbrances had been previously approved by the Public Utility Commission, or unless they can show that the Public Utility Commission after having been duly advised, had held that those alienations and encumbrances are exempted from the requisite of its approval on account of the little importance to the public interest of the nature and conditions of the business.

3. That prior to the making of any renewal of license a previous notice be sent to the Public Utility Commission, giving the name and addresses of the applicants and the commencement of their operation in order that the Public Utility Commission availing of the power granted to it by the Public Utility Act may require the corresponding public utility to file with it a statement showing the rates to be charged and the itineraries or routes served.

The term "Public Utility" is hereby defined to include every individual, copartnership, association, corporation or joint stock company, whether domestic or foreign, their lessees, trustees or receivers appointed by any court whatsoever, or any municipality, province or other department of the Government of the Philippine Islands, that now or hereafter my own, operate, manage or control within the Philippine Islands any common carrier, engaged in the transportation of passengers and cargo, line of freight and passenger automobiles, who offer their cars to the public, either in streets, roads or public squares, or if their rates are per passenger or by the trip.

Persons renting automobiles by the hour to one or more persons from their garage or recognized public stations are not common carriers, as interpreted by the Public Utility Commission. Automobiles, however, which, whether from a garage, recognized public auto station or anywhere along the route traveled, take passengers at so much per passenger or by the trip, is a common carrier, and therefore a "public utility."

In an opinion of the Public Utility Commission relative to what includes "public utility" the same is quoted as follows:

> "Under the provisions of Section 14 of Act 2307, as amended by Act 2694, the term "public utility" includes not only individuals and legal entities owning, operating, managing or controlling within the Philippine Islands lines of freight and passenger automobiles for public use, but also automobiles operated as common carriers without fixed termini just leaving the course of transportation to depend upon the customer's wish. (Application of Peter Greco for certificate of Public Convenience, Application Docket No. 416; Allegheny Valley Street Railway Company *versus* Peter Greco, Complaint Docket No. 641, Public Service Commission of the Commonwealth of Pennsylvania Report of November 15, 1916). It is to be understood, however, that the owners of garage are not considered public utilities, if they do not offer their cars to the public and they just wait in their houses or offices for passenger hiring to them the cars only per hour and not per passenger. (Case No. 748, Marcelo Caringal, et al). Nevertheless, if they offer the cars either in streets or in public squares, or if their rates are for passengers, they are public common carries and as such shall be deemed as public utilities."

All orders and circulars inconsistent herewith are hereby revoked.

C. RUSSELL,
Director of Public Works.

APPENDIX B.

MOTOR VEHICLES REGISTERED IN THE AUTOMOBILE DIVISION, BUREAU OF PUBLIC WORKS, IN ACCORDANCE WITH THE PROVISION OF EXISTING LAW SINCE JANUARY 1, 1918.

MOTOR CARS PRIVATELY OPERATED.

Registry No. and type.	Owner's name and address.
O1. Packard	Hon. Francis B. Harrison, Malacañang, Palace.
O2. Cadillac	Do.
O3. Ford	Do.
O4. Reserved	Do.
O5. White	Philippine Assembly, Manila.
O6. Hudson	Philippine Senate, Manila.
O7. Chandler	Vice-Governor C. E. Yeater, Army and Navy Club.
O8. Hupmobile	M. P. Leuterio, 412 Raon.
O9. ....do	Galicano Apacible, 140 Arquiza.
O10. Buick	Pacific Commercial Co., Manila.
O12. Dodge	Rafael Palma, 553 Leroy.
O13. Studebaker	Hadji Butu, 4 S. Marcelino.
O14. Cadillac	Charles C. Cohn, 1332 Pennsylvania.
O15. American	Jose Clarin, 182 Gral. Luna.
O17. Studebaker	Vicente Ilustre, 1067 Arlegui.
O18. White	Philippine National Bank, Manila.
O19. Willys Knight	Eugene E. Reed, Manila Railroad Co.
O20. Panhard	Isauro Gabaldon, 198 Buenavista.
O21. Buick	Dionisio Jakosalem, 803 Dominguez Alfonso.
O22. ....do	Venancio Concepción, 562 Legarda.
O23. Dodge	Jorge B. Vargas, 541 Union.
O24. Hudson	Jose Ma. Veloso, Tacloban, Leyte.
O25. Ford	Mrs. N. F. Ottofy, 54 Mabini.
O26. Scripps Booth	J. Pardo de Tavera, Figueras, Rizal.
O27. Dodge	Philippine Senate, Manila.
O28. Overland	Teodoro M. Kalaw, 515 Peñafrancia.
O29. Buick	Alberto Barretto, 188 Sta. Mesa.
O30. Dodge	Antonio C. Torres, 1228 Herran.
O31. Hudson	Celestino Rodriguez, Cebu.
O32. Overland	Pedro Guevarra, 446 Platerias.
O33. ....do	Jose Altavas, Capiz, Capiz.
O34. Renault	Rafael Alunan, 1077 R. Hidalgo.
O35. Maxwell	Francisco A. Delgado, 541 Union.
O36. Ford	Joaquin D. Luna, 814 Magdalena.
O37. Hupmobile	Eulogio Rodriguez, Montalban, Rizal.
O38. Hudson	Pedro Ma. Sison, 389 San Rafael.
O39. Renault	Mariano Escueta, 823 Dakota.
O40. Overland	Dr. Conrado Potenciano, 249 Solana.
O41. Dodge	Emilio Gonzalez, Sulipan, Apalit, Pampanga.
O42. Buick	Augusto Gonzalez, Apalit, Pampanga.
O43. Hupmobile	Fernando Perez, 43 Plaza del Carmen.
O44. Brasier	Manuel Lopez y Castelo, 932 Singalong.
O45. Dodge	Manuel Earnshaw, 268 Alhambra.
O48. ....do	Manuel Velasco, Tacloban, Leyte.
O49. ....do	Manuel Nieto, 404 Lamayan.
O50. Hupmobile	Ramon Lopez, Flores, 165 Magallanes.
O51. Overland	Enrique Lopez, 224 Arquiza.
O52. Dodge	Eduardo Diaz Perez, 1208 Oregon.
O53. Ford	Augusto Anguita, 239 Real.
O54. Renault	Ignacio R. Ortigas, 503 M. H. del Pliar.
O55. Buick	Do.
O56. ....do	Ignacio R. Ortigas, 501 M. H. del Pilar.
O57. Hupmobile	Rafael Villanueva, 544 Merced.
O58. Chandler	Jose Fabella, Makati, Rizal.
O59. Hudson	Lope P. Severino, 907 Indiana.
O60. Hupmobile	La Estrella del Norte, 46 Escolta.
O61. Maxwell	L. S. Boggess, Bureau of Public Works, Manila.
O62. Buick	Miss Josefa Tagawa, 522 Alvarado.
O63. Hudson	Leoncio Imperial, Albay, Albay.
O64. Studebaker	Dr. Ignacio Villamor, 1030 Vergara.
O65. Dodge	Antonio B. Manalo, Cabanatuan, Nueva Ecija.
O66. Hupmobile	Mariano Escueta, 823 Dakota.
O67. Dodge	Vicente T. Fernandez, Cavite, Cavite.
O68. Renault	Ed. Keller, 143 Juan Luna.
O69. Buick	Adriano Hernandez, Bureau of Agriculture.
O70. Overland	Ricardo Gonzalez Lloret, 621 Gonzalez.
O71. Dodge	Tomas Earnshaw, Pasay, Rizal.
O72. Renault	Do.
O73. Buick	Do.
O74. Dodge	Manuel Earnshaw, 268 Alhambra.
O75. Cadillac	Do.
O76. Renault	Jose Perez Stela, La Insular, Manila.
O77. Delahaye	Manuel Lopez y Castelo, 932 Singalong.
O78. Ford	Ralph Earnshaw, 60 Second Street N. P.
O79. Dodge	Vicente Aldanese, 170 M. de Comillas.
O80. Buick	I. Liongson, Bacolor, Pampanga.
O81. ....do	Vicente E. Reyes Alonzo, 471 Sales.
O82. Hupmobile	Angel Reyes, 411 Sales.
O83. ....do	Crispulo Zamora, 351 D. Hidalgo.
O84. Dodge	Trinidad Vda. de Zobel, 155 M. Comillas.
O86. Hupmobile	Smith Bell & Co., Ltd. Legaspi, Albay.
O87. ....do	Jose Luis de Castro, 100 Anda.
O88. Scripps Booth	Juan M. Arellano, 1047 Arlegui.
O89. Paige	Ramon Diokno, 48 Alhambra.
O90. Dodge	Pedro Valdes Liongson, Bacolor, Pampanga.
O91. Hudson	Perfecto J. Salas Rodriguez, 1517 Azcarraga.
O92. Buick	Petronilo del Rosario, 1701 Azacarraga.
O93. Ford	St. Lukes Hospital, 1023 Magdalena.
O94. Buick	Jose E. Jimenez, 853 San Fernando.
O95. ....do	Antonio M. Mañalak, 634 Trinidad.
O96. Dodge	Celso Dayrit, San Fernando, Pampanga.
O97. Buick	Eduardo Gutierrez David, 17 Tubos.
O98. Hupmobile	Severino Gilbuena, 73 Gral. Luna.
O99. Paige	Dr. Dario del Val, 37 Muralla.
O100. Ford	Gregorio Barretto, 303 Nueva.
O101. Renault	Ramon J. Fernandez, 103 San Rafael.
O102. Olds mobile	Do.
O103. Hupmobile	Do.
O104. ....do	Do.
O105. Brasier	Do.
O106. Opel	T. Bremer, 1040 Sta. Mesa.
O107. Buick	Liggett & Myers Tobacco Co., Manila.
O108. Hupmobile	Teodoro Chotangco, S. Pedro Makati, Rizal.
O109. Buick	G. de Vivanco, Pasay Beach, Rizal.
O110. Hupmobile	Dr. Manuel S. Guerrero, 7 A. Flores.
O111. Clement Bayard	Dr. Juan Miciano, 309 P. Faura.
O112. Dodge	Do.
O113. R. C. H	Maj. Aurelio Ramos, P. C. Camp Wilhem, Lucena, Tayabas.
O114. White	The Bachrach Motor Co. Malecon Drive.
O115. Overland	D. M. Fleming, 35 Manga Avenue.
O116. ....do	Lope P. Severino, 907 Indiana.
O117. Dodge	Mrs. Tobias and Regalado, 443 A. Mabini.
O119. Austin	Jose Montera, 88 S. Juan de Letran.
O120. Buick	John Dumas, Canlubang, Laguna.
O121. Overland	Jose Moreno Semanillo, 60 Second St.
O122. Ford	H. E. Higginbothem, 527 Leroy.
O123. ....do	G. G. Strobe, 1436 Leveriza.
O124. Peerless	J. Pardo de Tavera, Figueras, Rizal.
O125. Cadillac	Gibson Lumber Company, 724 Echague.
O126. Buick	A. T. Giovannini, 229 Concepcion.
O127. Dodge	Fermin Francisco, 628 Herran.
O128. Hupmobile	Agustina Santos, 720 Misericordia.
O130. Maxwell	A. H. T. Carpenter, 363 Sta. Mesa.
O131. Buick	J. Elizalde, Ynchausti y Cia.
O132. Wolseley	F. Von Knuffmann, Ynchausti y Cia.
O133. Cadillac	Santiago Elizalde, Ynchausti y Cia.
O134. Hupmobile	Maximino M. Paterno, 917 R. Hidalgo.
O135. Delahaye	F. Von Knauffmann, Ynchausti y Cia.
O136. Dodge	Dr. Luis Guerrero, 156 Isaac Peral.
O137. ....do	Ildefonso Ramirez, 143 Magallanes.
O138. ....do	Vicente Go Tangco, 513 T. Alonzo.
O139. Ford	W. W. Weston, 548 San Luis.
O140. Dodge	Juan Grey, 438 Evangelista.
O141. Hupmobile	J. B. Reid, 10 San Gabriel.
O142. Ford	E. E. Elser, Kneedler Bldg., Manila.
O143. Enger	Mariano Tuazon, 6 Manga Avenue.
O144. Ford	Do.
O145. Studebaker	Do.
O146. Wolseley	Meliton Ruiz Leyva, 529 Kansas.
O147. Detroit	Mariano Tuazon, 6 Manga Avenue.
O148. Enterstate	Do.
O149. Dodge	Vicente Morente, 1213 California.
O150. Chalmers	Jose R. de Ynchausti, 551 M. H. del Pilar.
O151. Reo	Isabel Y. de Fernandez, 803 M. H. del Pilar.
O152. Chalmers	R. E. Spencer, Tagbilaran, Bohol.
O153. Mitchell	Levant Brown, B. V. W., Manila.
O154. Hudson	B. S. Everett, 973 M. H. del Pilar.
O155. Metallurgique	Mariano Limjap, 631 Echague.
O156. Hupmobile	Pacific Commercial Co., Manila.
O157. Buick	Do.
O158. ....do	Do.
O159. ....do	Do.
O160. Kissel Kar	Mariano Limjap, 831 Echague.
O161. Dodge	Do.
O162. Buick	M. J. Hasetton, 535 Colorado.
O163. Overland	Francisco Villanueva, 551 Legarda.
O164. Panhard	H. S. Everett, M. H. del Pilar.
O165. ....do	Estanislao Feliciano, 655 Mabolo.
O166. Renault	Maria Gay, 1007 Herran.
O167. Overland	Benito Razon, 401 Paz.
O168. Brasier	Ambrosio Reyes 703 Evangelista.
O169. Buick	Otis L. Venderford, Sta. Cruz Fire Station.
O170. Delahaye	Candelaria Vda. de Cacho, 233 Gral. Luna.
O171. Renault	Ramon Sotelo, 227 Elizondo.
O172. Buick	Adolfo Garcia, 32 Sta. Potenciana.
O173. Brasier	Vicente Miranda, 107 Arquiza.
O174. Dodge	Dr. Ricardo Fernandez, 126 Cabildo.
O175. Delahaye	S. Terriols, 660 Echague.
O176. Dodge	Modesto Sison, Alaminos, Pangasinan.
O177. ....do	Vicente Encarnación Singson, 573 Legarda.
O178. Cadillac	Carlos Gsell, 625 Paterno.
O179. ....do	James R. Redfern, 90 Rosario.
O180. Hupmobile	Ricardo Gonzalez, 915 A. Mabini.
O181. Hudson	Florentino Torres, 1712 Azcarraga,
O182. Ford	Do.
O183. Hupmobile	Luis P. Torres, 609 S. Marcelino.
O184. ....do	Consolación Singian, S. Fernando, Pampanga.
O185. Cadillac	H. S. Everett, 973 M. H. del Pilar.
O186. Hudson	F. Perez de Muñoz, 87 Balmes.
O188. Ford	F. O. Smolt, 2 Isla de Romero.
O189. Dodge	Teodoro S. Benedicto, 18 Iznart, Iloilo.
O190. Cadillac	Pacific Commercial Co. Manila.
O191. Hudson	Felipe R. Caballero, 588 Legarda.
O192. Maxwell	Antonio Vazquez, 815 Wright.
O193. Hupmobile	Do.
O194. ....do	Vda. e Hijo de P. P. Roxas, 471 Echague.
O195. ....do	Mauricio Cruz S. Pablo, Laguna.
O196. Metz	Dr. Florencio Lara, 322 Raon.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O198. Overland	Adolph Kopp, 165 Buenavista.
O200. Renault	Jose F. Fernandez, 275 Concepcion.
O201. Hupmobile	Do.
O202. Renault	Concepcion Leyba, Sta. Ana, Manila.
O203. Hupmobile	Tomas Virtucio, 2 Brixton Hill.
O204. Maxwell	H. O. Leary, Elks Club.
O205. Smith	H. F. Streegan, 716 Dakota.
O206. Oakland	Mariano Yenco, 1057 Felix Huertas.
O207. Hudson	L. Dyson, 158 J. Luna.
O208. Hupmobile	Jose Jimenez, 982 Singalong.
O209. Ford	Dr. Isaac Eustaquio, Mariquina, Rizal.
O210. do	Antonio Sanz, 48 Panadero.
O211. Hupmobile	Felix de Leon, S. Miguel, Bulacan.
O212. Willys Knight	J. C. Mariño, 512 S. Luis.
O213. Maxwell	Jose Bustamante, 413 Sto. Cristo.
O214. Buick	Emeterio Sempio, 713 Azcarraga.
O215. Oldsmobile	Ceferino de Leon, S. Miguel, Bulacan.
O216. Overland	Hon. Manuel Lopez, 413 P. Faura.
O217. Saxon	Felix de Leon, S. Miguel, Bulacan.
O218. Hupmobile	Philippine Sugar Co., Plaza Moraga.
O219. Hudson	Felipe Canillas, 928 Wright.
O220. Everitt	Agustin Chopre, 544 S. Luis.
O221. Hudson	F. E. Calloway, Ft. McKinley, Rizal.
O222. Moon	Mariano Larena, 57 M. H. del Pilar.
O223. Dodge	Francisco Martinez, Balayang, Batangas.
O224. Renault	A. Arriola y Luminato, 617 Gral. Luna.
O225. Buick	Rafael Arriola, c/o Philippine Sugar Estate.
O226. Saxon	Ricardo Leynes, 436 Rizal Avenue.
O227. Buick	B. Chuntianlay, 139 Rosario.
O228. do	Go Lay, 228 Rosario.
O229. Ford	Guillermo Ruiz, 843 Clavel.
O230. Dodge	C. E. Unson, 1340 Herran.
O231. Hudson	Guillermo F. Ruiz, 843 Clavel.
O232. Hupmobile	Eusebio Ramirez, 345 Palma.
O233. Dodge	Ramon Capistrano, 7 Magallanes.
O234. do	Peter Johnson, Cavite, Cavite.
O235. Oakland	Y. Yan Chiong, 441 S. Vicente.
O236. Maxwell	Rt. Rev. J. P. McCloskey, Zamboanga, Zamboanga.
O237. Hudson	A. H. Limgenco, 127 Plaza del Conde.
O238. Dodge	M. W. Staight, 1221 E. M. H. del Pilar.
O239. Overland	M. Perez y Gomez, M. Comillas.
O240. Hupmobile	Francisco Sevilla, 1003 O'Donell.
O241. Buick	Do.
O242. Dodge	Valentin Manglapus, 234 Madrid.
O243. Overland	Ildefonso de Guzman, 619 Aceiteros.
O244. Maxwell	Vicente E. Manapat, Arayat, Pampanga.
O245. Hupmobile	Dr. Jose Albert, 500 Zurbaran.
O246. Maxwell	Dr. Potenciano Guanzon, 1233 Herran.
O247. Renault	Amada Mestres, 247 Alhambra.
O248. Dodge	Parsons Hardware Co., Manila.
O249. do	Irene A. Vda. de Alberto, 672 Venavidez.
O250. Chandler	J. E. Hamilton Stevenot, Manila Hotel.
O251. Studebaker	Jose de Leon, S. Miguel, Bulacan.
O252. Hupmobile	Do.
O254. Lexington	Jose de Leon Jr., S. Miguel Bulacan.
O255. Dodge	Florencio Cordillo, 872 M. H. del Pilar.
O256. do	Beatriz de Rosa, 798 Sta. Mesa.
O257. Studebaker	Isidro Martinez, 1032 Herran.
O258. Dodge	Cornelio Martinez, Malabon, Rizal.
O259. R. C. H	Tomas Domingo, 444 Pavia, Manila.
O260. Hupmobile	Ayala & Co., 652 Echague.
O261. Brasier	Sra. Trinidad de Ayala, vda. de Zobel, 155 M. de Comillas.
O262. Hupmobile	Enrique Zobel, 501 L. Guerrero.
O263. Hudson	Fernando Zobel, 165 M. de Comillas.
O264. Ford	H. E. Strafford, 124 Gral. Solana.
O265. Cadillac	Do.
O266. Renault	Benito Siy Cong Beng, 123 Juan Luna.
O267. Hupmobile	Eusebio Orense, 34 Plaza McKinley.
O268. Willys Knight	Florencio Gonzales, 130 Alix.
O269. Maxwell	Mrs. Pilar Ferras, Lingayen, Pangasinan.
O270. Ford	W. W. Larkin, 141 Remedios.
O271. Dodge	Mrs. Margaret Sloan, 142 Sociego.
O272. Hupmobile	Jose A. Memije, 73 Real, Pasay.
O273. do	Do.
O274. do	Antonio Camos Rueda, 149 M. de Comillas.
O275. do	J. Carrero, 520 S. Luis.
O276. Ford	Santiago M. Gunzon, Malabon, Rizal.
O277. Renault	Florentino Herrera, 1264 Tuberias.
O278. Hupmobile	Beatriz Alcala, Sariaya, Tayabas.
O279. Ford	C. S. Salmen, c/o Insular Life Ins. Co.
O280. Cadillac	Jose Ortigas, 333 Elcano.
O281. Ford	R. E. McScoth, 26 Leveriza.
O282. Hupmobile	O. Ranft, Pasay Beach, Rizal.
O283. Ford	F. A. Heppell, Pasage del Carmen.
O284. Studebaker	H. D. Kneedler, 910 A. Mabini.
O285. Pullman	Lorenzo Ordoñez, 285 Solana.
O286. Hupmobile	Mauricio Kahn, Estrella del Norte.
O287. Hudson	Andres Eusebio, Sto. Rosario, S. F., Pam.
O288. Overland	Antonio de Asis, 803 Ongpin.
O290. Ford	Manuela B. Reyes, 603 Sales.
O291. do	George Herbert Tilwry, 1330 Alhambra.
O292. Willys Knight	Dalmacio Costas, National Coal Co.
O294. Hotchkiss	Manuel Caromina, 2158 Azcarraga.
O295. Dodge	Cooper Co., Inc., 109 J. Luna.
O296. Buick	M. Hadenfeldt, 920 Wright.
O297. Dodge	The Cooper Co., 109 Juan Luna.
O298. Ford	Jose M. L. de Moreta, 53 Florida.
O299. do	Pacific Cable Co., El Hogar Fliipino Bldg.
O300. Stearns-Knight	Thomas Cary Welch, 14 Pinpin.
O301. Dodge	Mitsui Busan Kaisha, 90 Rosario.
O302. Buick	G. P. Datoma, 924 Wright.
O303. do	Mrs. W. A. Daland, 77 Nagtahan.
O304. Hudson	Antonio R. Roxas, 21 Gral. Luna.
O305. Maxwell	F. M. Yaptico, 197 J. Luna.
O306. Cadillac	Jesus Gonzales, 668 M. H. del Pilar.
O307. Buick	Compania de Seguros, Hogar Filipino Bldg.
O308. E. C. H	Herman Anerbach, S. Sebastian Hotel.
O309. Dodge	Jesus Ocampo, 309 Palma.
O310. Hupmobile	Rufino Rodriguez, 721 T. Alonzo.
O311. Buick	Roman Chio Cinco, 211 Gandara.
O312. Studebaker	R. L. Moseley, Stotsenburg.
O313. Ford	Fremont Norse, 150 Buenavista.
O314. Dodge	Maria Opiso de Rosado, 2 Uli-uli.
O316. do	Pedro Concepcion, 30 Perdigon.
O317. Maxwell	Gibson Lumber Co., 724 Echague.
O318. Hupmobile	Mariano P. Villanueva, 434 Isaac Peral.
O319. Buick	Raymundo Zapanta, 143 Guipit.
O320. Hupmobile	Isidro Morales, 310 Plaza Miranda.
O321. Ford	Do.
O322. Overland	Thos S. Carrington, St. Anthony Hotel.
O323. Roadster	Bonifacio Hernandez, 423 A. Mabini.
O324. Hudson	Bartola Santos, S. Fernando, Pampanga.
O325. Renault	Dr. Ariston Bautista, 325 Barbosa.
O326. Studebaker	Antonina Mariano, 143 Guipit.
O328. Partin Palmer	Leonard Dyson, c/o Wise Co.
O329. Cadillac	R. E. Rumphreys, c/o Wise Co.
O330. France	W. Keller, 143 Juan Luna.
O331. Dodge	Li Seng Giap, 116 Elcano.
O332. Hudson	Agustin Yaptinchay, Biñan, Laguna.
O333. Ford	Enrique Barreray Caldez, 202 Anda.
O334. Cadillac	Jose Escaler, 208 S. Rafael.
O335. Buick	Do.
O336. Ford	P. H. Cuento, 1085 A. Rivera.
O337. Buick	Petronilo Valenzuela, 669 Gandara.
O339. Maxwell	Nactaro Incuye, 941 Herran.
O340. Chandler	J. M. Bayot, 935 Mabini.
O341. Delahaye	Joaquin J. de Ynchausti, 941 M. H. del Pilar.
O342. Hudson	Do.
O343. Dodge	Otha Development Co., 214 David.
O344. Ford	Jose del Rosario, Ligao, Albay.
O345. Overland	Frank Moffold, 664 Isaac Peral.
O346. do	Esteban Espiritu, Imus, Cavite.
O347. Hupmobile	Domingo Lim, 428 Fundidor.
O348. Peugot	Canuto Sto. Tomas, 617 Gandara.
O349. Buick	Benjamin L. Surdete, St. Lukes Hospital.
O350. Dodge	Vicente Arias, 77 Gastambide.
O351. do	Francisco Aguado, 531 M. H. del Pilar.
O353. Ford	Robert H. Wilds, Dept. Hospital, Ft. McKinley.
O354. Scripps-Booth	P. W. Rustan, 910 Santol.
O355. Dodge	Teodoro R. Yangco, 421 Paz.
O356. Renault	Do.
O357. Buick	Felix Fanlo, 51 Estero de Binondo.
O358. Ford	Lorenzo Javier, 621 M. H. del Pilar.
O359. Maxwell	T. A. Lynch, Ft. McKinley, Rizal.
O360. Hudson	Fernando Sobel, 165 M. Comillas.
O361. Buick	Gregorio Pedro, S. Felipe Nery, Rizal.
O362. do	Do.
O363. Ford	Charles C. Cohn, 1332 Pensylvania.
O364. Buick	Gelasio Lerma, Caloocan; Rizal.
O365. Opel	M. Vigelman, 71 Valenzuela.
O366. Hupmobile	L. A. Barretto, 213 S. Antonio.
O367. Renault	Yu Ceng Eng, 696 J. Luna.
O368. do	Manuel T. Hidalgo, 745 Ongpin.
O370. do	Juana U. Vda. Chuidian, 953 Mabini.
O371. Chandler	Adelaida Abreu de Hollman, 19 A. Mabini.
O372. Overland	Do.
O373. Maxwell	Sy Yeng Antonio Barretto, 313 Tanduay.
O374. Hudson	Engracia Jacinto, 313 Echague.
O375. Brasier	Herederos de Pio Barretto, 716 Echague.
O376. Saxon	Vicente Valbuena, S. Pablo, Laguna.
O377. Hupmobile	Angel Garchitorena, 14 Nebraska.
O379. Dodge	Pedro Insua, Plaza de Mallorca.
O380. Waverly	M. E. R. R. & L. Co., Manila.
O381. Overland	Leoncio Silva, Biñan, Laguna.
O382. Ford	M. E. R. R. & L. Co., Manila.
O383. Waverly	Do.
O384. do	Do.
O385. Dodge	Juan Feliciano, 1106 Azcarraga.
O386. Studebaker	L. L. Vincent, Bureau of Public Works, Manila.
O387. Dodge	Francisco Ortigas, 120 Legarda, Manila.
O388. Hudson	Do.
O389. Dodge	Vicente Chuu So, 214–218 S. Vicente, Manila.
O390. Buick	Mrs. P. W. Parker, c/o Standard Oil Co., Manila.
O391. Waverly	Ildefonso Villareal, 215 Lope de Vega, Manila.
O392. Scripps-Booth	Do.
O393. Austin	Do.
O394. Overland	A. Marcuson, 215 Echague, Manila.
O395. Pullman Car	Aniceta Bondoc, 351 Caballeros.
O396. Hupmobile	Judge Jose Abreu, Lucena, Tayabas.
O397. Dodge	Rafael Fernandez, S. Miguel, Manila.
O398. Ford	Arthur N. d'Aran, 945 Misericordia.
O399. Paige	Oscar Echuetze, 1259 Penn. Ave, Manila.
O400. Chevrolet	E. B. Scott, Manila Hotel.
O401. Dodge	Frank E. Rhadez, 362 Lamayan, Manila.
O403. Hudson	Pablo Azcarrate, P. Alcantara, S. Pablo, Laguna.
O404. Ford	Ramon Naguiat, 205 Moriones, Manila.
O405. Saxon	Dr. Manuel S. Guerrero, 7 A. Flores, Manila.
O410. Hupmobile	A. A. Yaptinchay, 910 Azcarraga, Manila.
O411. Hudson	Tan Chong Say, S. Pablo, Laguna.
O412. Dodge	Davao Commercial Co., Davao, Davao.
O413. Ford	Edwin L. Driggs, 913 M. H. del Pilar, Manila.
O414. Hupmobile	Tee Hang Kee, 721 Reina Regente, Manila.
O415. Buick	Lino Torres, 528 Ronquillo, Manila.
O417. Dodge	Januario M. Coronado, Makati, Rizal.
O418. do	Felipe Guanzon, 402 Echague, Manila.
O420. do	Walter Bruggman, Poblacion, Tarlac.
O421. Maxwell	J. G. Lawrence, Pasay, Rizal.
O422. Ford	The United Plumbing Co., 682 Juan Luna.
O423. Cadillac	S. C. Choy, 672 Juan Luna.
O424. Hupmobile	F. Bregman, 35 Remedios.
O425. Dodge	Federico Correa, 212 M. de Comillas.
O426. Hudson	Alfredo Chicote Beltran, 230 S. Luis, Manila.
O427. Ford	Wm. S. Harris, 616 Colorado, Manila.
O428. Buick	Maximo Viola, San Miguel, Bulacan.
O429. Maxwell	Lutz & Co. Rosario, Manila.
O430. Dodge	Arsenio N. Luz, 907 Taft Ave., Manila.
O431. Hudson	Augusto Tuazon, Manila.
O432. Hupmobile	Joseph G. Brimo, 217 Valenzuela, Manila.
O433. Brieces	Dr. Angel Valera y Calderon, 182 Solana, Manila.
O434. Buick	Pio Sian Mellisa, Iloilo, Iloilo.
O435. Brasier	Juliana Melliza Vda. de Sian, Iloilo, Iloilo.
O436. Delahaye	St. Paul's Hospital, Gral. Luna, Manila.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O437. Briscoe	Ferdinand Rustant, 199 Victoria.
O438. Overland	Antonio Manalao, Cabanatuan, Nueva Ecija.
O439. Excelsior	G. Clair Barlett, 46 Soliman, Manila.
O440. Dodge	Pio Trinidad, 834 Rizal Ave., Manila.
O441. Hupmobile	Pablo Ignacio, San Miguel, Bulacan.
O443. do	Do.
O444. Rambler	N. T. Hashim, 1091 Oroquieta, Manila.
O445. Hupmobile	Justino Jimenez, Makati, Rizal.
O446. Overland	Ty Chuaco & Co., 318–320 Sto. Cristo, Manila.
O447. Hupmobile	Miss Valentina Garcia, 313 Barbosa, Manila.
O448. Buick	C. Itoh & Co., 451 Juan Luna.
O450. Ford	Mrs. Allice M. Miller, 612 Colorado.
O451. Maxwell	Juan M. Cue, 861 Juan Luna.
O452. Hupmobile	Florencio Reyes, 1937 Juan Luna.
O453. Ford	Valentina Ignacio, San Miguel, Bulacan.
O454. Buick	Yu Tu & Co., 511–13 Sto. Cristo.
O455. Overland	Chas G. Sail, Manila Hotel.
O456. Hupmobile	Alfonso M. Tiaoqui, 611 Ongpin.
O457. Buick	Serapion Valle Cruz, 811 Ilaya.
O459. Overland	Henry Herman, 331 S. Rafael, Manila.
O460. Empire	Vicente Rodriguez Lanuza, 2129 Herran.
O461. Maxwell	Siulong & Company, 6 Ingreso, Manila.
O462. Panhard	Do.
O463. Hupmobile	Damaso Sompio, San Miguel Bulacan.
O464. Studebaker	W. R. Babcock, 66 Nagtahan.
O465. Cadillac	Manuel G. San Pedro, 817 Globo de Oro.
O466. Renault	Antonio R. Roxas, 21 Gral. Solano.
O467. Studebaker	Faustino Raymundo, Aceiteros.
O468. Hudson	Salvador Saragosa, 63 Cabildo.
O469. Ford	A. H. Flunker, Camp Stotsenburg, Pampanga.
O470. Buick	Prudencio de Jesús, 615 Evangelista.
O471. Dodge	Gordon McPherson, Cebu, Cebu.
O472. Brasier	Ramon Heras, 26 Santiago.
O473. Hupmobile	Rafael Singson, 48 Women Club, Flores, Malabon, Rizal.
O475. Dodge	Alejandro Gonzalez, Rosales, Pangasinan.
O476. Maxwell	Mamerto Suiza, Nagcarian, Laguna.
O477. Buick	Manuel Locsin, Silay, Occidental Negros.
O478. Ford	Dr. Benito Valdez, 904 R. Hidalgo.
O479. Buick	Nicolas Buendia, Malolos, Bulacan.
O480. Ford	Antonio Martin, 621 Gonzalez.
O481. Buick	John D. McCord, 92 Gastambide.
O482. Hudson	Jose B. Suntay, Hagonoy, Bulacan.
O483. do	Antonio P. Roxas, 21 Gral. Solano.
O484. Dodge	Florentina Valdez, Bacolor, Pampanga.
O485. Chandler	Agapito Nadal, 82 S. Marcelino.
O487. Hotchkiss	Lim Tuico, 200 Rosario.
O488. Ford	Macario Lim Manapat, 902 Albuquerque.
O489. do	Sixto de los Angeles, 605 Sales.
O490. Buick	John B. Reuters, 231 Gral. Solano.
O491. Overland	Daniel Martinez, La Paz, Tarlac.
O492. Maxwell	F. J. Tew, M. E. R. R. & L. Co., Manila.
O493. Overland	Daniel Boguer, 339 Herran.
O494. Hupmobile	Teodoro Jocson, Himalayan, Occidental Negros.
O495. Hudson	Antonio P. Roxas, 21 Gral. Solano.
O496. do	Do.
O497. Ford	Feliciano Crisologo, Laoag, Ilocos Sur.
O499. Paige	Mrs. Blanca Fontela, 405 Aviles.
O500. Dodge	M. C. Grey, 1110 Soler.
O501. Paige	Juan Garcia, 332 Palma.
O504. Buick	Aurelio M. Sison, Ayala Boulebard.
O505. Hudson	Jose Velasco, 645 Soler.
O506. Stanley	W. Huse Chaupman, Masonic Temple.
O508. Overland	Dalmacio C. Guidote, 814 Echague.
O509. Dodge	Jose Cojuanco, 401 Elcano.
O510. Maxwell	Kimpton Himes, 817 Santol.
O511. Hupmobile	Hon. Vicente Ilustre, 1067 Arlegui.
O512. Renault	Leon F. Rustia, Baliwag, Bulacan.
O513. Hudson	Sra. Rosario Vizcarra, 503 T. Alonzo.
O514. Ford	J. Heinrich, Manila.
O515. Studebaker	Vicente Litiatco, 950 Azcarraga.
O516. Dodge	F. A. Thomson, 176 Buenavista.
O517. do	V. Buencamino, 1026 Felix Huertas.
O518. Hudson	Jose Lim Chumbuque, 1009 Taft Ave.
O519. Hupmobile	Luis A. Barretto, 718 Colorado.
O520. do	A. Maack, 746 Sta. Mesa.
O521. Buick	Marcelino Reynoso, Sariaya, Tayabas.
O522. Willy's Overland	W. A. Macfarlane, 811 Echague.
O523. Brasier	Gliceria Jalandoni, 115 A. Mabini.
O524. Hudson	Domingo F. Lao, 522 Elcano.
O525. Hupmobile	Jose de Garchitorena, 14 Nebraska.
O526. Maxwell	Tan Samco, 437 Salazar.
O527. Dodge	Jose M. de Santos, 1092 Aceiteros.
O528. Hupmobile	O Cau Cun, 179 Muelle de Binondo.
O529. Hudson	The Sanitary Steam Laundry Co., Inc., 908, Arlegui.
O530. Renault	Juan Villanueva, 1016 Arlegui.
O531. Ford	Joaquin Oquiñena, Cebu, Cebu.
O532. Hupmobile	John J. Russell, 7 Nagtahan.
O533. Renault	Ygnacio Sy Yap, 661, Ilaya.
O534. Ford	C. S. Salmon, Kneedler Bldg., Manila.
O535. Buick	Dr. Ramon Papa, 710 Evangelista.
O536. Hudson	Enrique Brias, 1107 Herran.
O537. Maxwell	Chesley Conde & Co., 105 Duque de Alba.
O538. Ford	Elias Zaragosa, 1028 R. Hidalgo.
O539. do	C. S. Salmon, Kneedler Bldg., Manila.
O540. Renault	Santiago Ortiga, 622 Ongpin.
O541. Hudson	R. A. McGrath, 918 Indiana.
O542. Buick	Do.
O543. Maxwell	C. N. Vandervort, 286 S. Marcelino.
O544. Ford	Jose Grey, 19 A. Flores.
O545. Dodge	Vicente Pantanco, 1117 Ave. Rizal.
O546. do	Percy T. Chilvers, 104 Sta. Mesa.
O547. do	G. Strebel, c/o Struckman & Co., Manila.
O548. Buick	J. W. Cairus, Plaza Moraga.
O549. American	Vicente Tarnate, 1207 Singalong.
O550. Buick	Earle Brackett, 1102 M. H. del Pilar.
O551. Saxon	A. P. Brown, 648 Magdalena.
O553. Ford	Dr. Alvin J. Cox, 1218 A. Mabini.
O554. Buick	Dr. Bonifacio Zamora, 1316 Sande.
O555. Hupmobile	Manuel Sabater, 561 P. Paterno.
O556. Ford	Herman G. Maul, 901 Wright.
O557. Dodge	J. D. Long, 601 Wright.
O559. Ford	Jose Limkako, 771 Soler.
O560. Hupmobile	Carl Miller, 187 Manga Ave.
O561. Ford	Luzon Brokerage, Manila.
O562. Metz	Feliciano Quiogue, 247 Soler.
O563. Hupmobile	Pedro de Gala, Candelaria, Tayabas.
O564. Delahaye	Mariano Uy Chaco Sons Co., Plaza Cervantes, Manila.
O565. Maxwell	Alfredo Wigner, 1124 Estero, Manila.
O566. Ford	G. Mandelbaum, 272 Marcelino.
O567. Chandler	Manuel N. Tuazon, 18 Gral. Luna.
O568. Hupmobile	Luis Sidebottem, Cebu, Cebu.
O570. Dodge	J. N. Cue, 369 Elcano.
O571. Buick	Augustin Guievara, 450 P. Gomez.
O572. Overland	Amando Viola, Malabon, Rizal.
O574. Saxon	Nicanor de Guzman, Pateros, Rizal.
O575. Dodge	Serafin Villanueva, S. Fernando, Pampanga.
O576. Hupmobile	Maximo Licauco, 1025 Soler.
O578. Overland	Servando de los Angeles, 163 Bustillos.
O579. Saxon	Ernesto Vidal, 7 Brixton Hill.
O580. Studebaker	Mrs. D. D. Moffett, 664 Isaac Peral.
O581. Renault	Teodoro Santos, S. Fernando, Pampanga.
O583. Saxon	Felipe Gomez, Iloilo, Iloilo.
O585. Buick	Pemsen B. Ogilby, Baguio, Benguet.
O587. Hudson	Tito Silverio, Pontevedra, Occidental Negros.
O588. Hudson	Victoria Tuazon, 588 Legarda.
O590. Buick	Petrona Dy Jiongco, 410 Juan Luna.
O591. Flanders	Doroteo Karagdag, Zamboanga, Zamboanga.
O592. Hupmobile	L. B. Sackett, Manila.
O593. Dodge	Ramon Zaldarriaga, 605 Lara.
O594. Hupp Motor	Fernandez Hnos., Manila.
O595. Overland	Jose G. Generoso, 623 Raon.
O596. Scripps Booth	Alfredo Carmelo, 2037 Azcarraga.
O597. do	Augusto Palma, 42 Soler.
O599. Dodge	Damaso Sempio, San Miguel, Bulacan.
O600. Hupmobile	Emanuel Strauss, 1004 Carolina.
O602. Hudson	Mauro Prieto, 964 R. Hidalgo.
O603. Renault	Do.
O604. Scripps Booth	Do.
O606. Panhard	Simeon A. Villa, 134 P. Faura.
O607. Buick	Ana R. Vda. de Bischoff, 715 Penn. Ave.
O608. Maxwell	J. F. Loader, 203 Lamayan, Sta. Ana.
O609. Cadillac	Victorien H. Meyer, 934–936 R. Hidalgo.
O610. Hupmobile	Vicente Gomez, Mariquina, Rizal.
O611. Clement Bayard	Dr. Victor Sevilla, Brixton Hill.
O612. Chandler	Do.
O614. Dodge	Mrs. Clotilde Barredo, 416 Legarda.
O615. do	Tomas de Jesus, 1916 Kusang Loob.
O616. Cadillac	Jose Velasco, 643 Soler.
O617. E. M. F.	E. G. McCullolgh, Manila.
O618. Dodge	Primitivo S. Agustin, 1107 Pennsylvania.
O619. do	Enrique Brias, 1027 Herran.
O620. do	Braulio Angeles, 548 Echague.
O621. do	Chua Tuan Pemg, 111 Escolta.
O623. Brasier	Dr. Felipe Zamora, 393 Gral. Luna.
O624. Dodge	Alfonzo Ortiga, 214 Dasmariñas.
O625. Hudson	Jose A. Paterno, 645 Rizal Ave.
O626. Renault	Alfonzo Locha, 285 San Rafael, Manila.
O627. Ford	Jose F. Zamora, Silang, Cavite.
O628. Dodge	Josefa de Osorio, 46 Gral. Solano.
O629. Buick	Florentino Mariño, San Pablo, Laguna.
O630. Renault	Ricardo Gutierez y Lorenzo, Malabon, Rizal.
O631. Ford	D. N. Hanna, 1353 J. Luna.
O632. Overland	Maria Villanueva de Salas, 489 Peñafrancia.
O633. Buick	Francisco Gutierez, 827 M. H. del Pilar.
O634. Overland	Jose M. Arroyo, 116 Cortada.
O635. Hupmobile	Honorato A. Santos, 27 F. T. Hugo Int., Sta. Ana.
O636. Renault	Ramon Fabie, 426 Juan Luna.
O638. Ford	Samuel E. Kome, 99 Habana, Sta. Ana.
O639. Oakland	Ramon Fabie, 426 Juan Luna.
O640. Ford	E. B. Harris, 222 A. Mabini.
O641. do	E. C. McCullough Co., Manila.
O642. Hupmoblie	Cenon Marcelo, 94 Lamayan.
O643. Studebaker	Arsenio Sebastian, Vigan, I. Sur.
O644. Ford	E. C. McCullough, Manila.
O645. Overland	Francisco Bangoy, Davao, Mindanao.
O646. do	Jose M. Lerma, 812 R. Hidalgo.
O647. Buick	E. N. Ayers, 524 Azcarraga.
O648. Overland	Chua Chivan, 429 Nueva.
O649. Ford	Concepcion Felix vda. de Calderon, 38 Lamayan.
O650. Hupmobile	Cenon Ayala, San Pedro Makati, Rizal.
O652. do	The Manila Rail Road Co., Manila.
O653. Overland	Ricardo Garcia, 305 El Dorado.
O654. Hupmobile	Jas. H. Allan, Caloocan, Rizal.
O655. Saxon	Miguel Francia, Maycauayan, Bulacan.
O656. Dodge	Canuto H. Fernandez, 1349 Rizal Ave.
O657. Buick	Johnson Yu Hio Hui, 803 Wright.
O658. Dodge	Jaime Valles, Manila.
O659. Buick	Felix E. Marfori, Folgueras 911.
O660. Hudson	Emilio Gonzales La O, 51 L. Guerrero.
O662. Dodge	Librada Rodriguez, Bacolor, Pampanga.
O664. Panhard	Moises A. Gala, Sariaya, Tayabas.
O666. Maxwell	Walter A. Smith, 1298 Agno.
O668. Hupmobile	Maximo B. Solis, Sariaya, Tayabas.
O669. Trumbull	H. Furukawa, S. Fernando, Pampanga.
O670. Buick	Capt. Alfred Ballin, Camp John Hay, Mountain Province.
O671. Hudson	Petronilo Perez, 406 Dorado.
O672. Chandler	Jose Reyes Cobarrubias, City Hall, Manila.
O673. Hudson	Enrique F. Somes, 530 Legarda.
O674. A. O. Smith	Vicente Somes, 530 Legarda.
O675. C. Club Oakland	Juan Marcelino, Cabanatuan, Nueva Ecija.
O676. Overland	G. B. Wicks, Masonic Temple, Manila.
O677. Hupmobile	Rosario R. Hidalgo, 677–685 Tanduay.
O678. National Motor	E. C. McCullough Co., Manila.
O680. Dodge	Jose Arrevalo, 409 R. Hidalgo.
O682. Ford	Telesforo Martinez, 296 Cabildo.
O685. Hupmobile	Felipe R. Hidalgo, 677–685 Tanduay.
O687. Ford	Dr. Santiago Barcelona, 1069 Juan Luna.
O690. Dodge	Henry W. Baird, Fort McKinley, Rizal.
O691. Hupmobile	Jose M. Ocampo, 158 Mendoza.
O692. Ford	Mariano Ocampo de Leon, 158 Mendoza.
O693. Hupmobile	Do.
O694. Ford	Isidro de Santos, 1092 Aceiteros.
O695. Dodge	Dr. W. Smith, 107 Escolta.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O696. Hupmobile	Felipe Agoncillo, 1128–1134 M. H. del Pilar.
O697. Ford	Miguel Fujalte, 1067 Muelle de la Industria.
O698. Hupmobile	B. Vierich, 94 Nagtahan, Manila.
O699. Dodge	Mrs. W. A. La Mountain, 1550 M. H. del Pilar, Manila.
O700. Reo	Ambrosio Santos, 37 Tubos, Manila.
O701. Hudson	Leuis McCall, Elks Club, Manila.
O702. Reo	J. Reich, 612 S. Marcelino.
O703. Chandler	Do.
O704. Dodge	Thomas A. Street, 704 Wright, Manila.
O705. Hupmobile	Carlos Palanca, 381 Juan Luna.
O706. Overland	J. H. Fistbutler, 2003 Ave. Rizal.
O707. Hudson	Manuel Escudero, 617 Kansas Ave.
O710. Maxwell	S. W. O'Brien 131 P. Faura, Manila.
O711. Dodge	Vicente Versosa, 306 del Pan, Manila.
O712. Hupmobile	Chua Che Teak, 260 Juan Luna.
O713. Dodge	Dr. Angel Valenzuela, Guagua, Pampanga.
O714. Ford	Ramon Diaz, 426 San Luis, Manila.
O715. Everett	Natividad Concepcion, Porac, Pampanga.
O716. Renault	Enrique Brias de Coya, 1027 Herran.
O717. Hudson	Jose Velasco, 645 Soler.
O719. Maxwell	Francisco Rivera, 719 Kansas.
O720. Hupmobile	Basilia Vda. de Herrera, 720 Colorado.
O721. do	Pieter W. Werff, 46 Escolta, Manila.
O722. Austin	Margarita Rodriguez, 722 Soler.
O723. Dodge	Antonio Malvehy, 135 M. de Comillas.
O724. Hupmobile	A. Campos Rueda, 149 M. de Comillas.
O725. do	Vicente Javier, Caloocan, Rizal.
O726. Overland	Raymundo Gutierez, 151 Real.
O727. Hupmobile	Juan Azarraga, Calivo, Capiz.
O728. Renault	Antonio P. Roxas, 21 Gral. Solano.
O729. Scripps Booth	Antonio P. Roxas, jr., 21 Gral. Solano.
O730. Hupmobile	Felipe Lumain, Tubigon, Bohol.
O732. Overland	Hon. Kwei, Chich, 60 M. H. del Pilar.
O735. Maxwell	Perfecto Bustamante, 317–319. Raon.
O734. Ford	Emilio Soriano Alcala, Pangasinan.
O736. Dodge	Dr. Hans Schmid, 3031 Guerrero.
O738. Ford	O. F. Campbell, Pasay Beach, Rizal.
O739. Hupmobile	Miguel J. Osorio, 39 Gral. Solano.
O740. Ford	Women's Foreign Missionary, 101 Quesada.
O741. Paige Motor	Eugenio Bucepe, 741 Juan Luna.
O742. Ford	Capt. Norman E. Cook, P. S., Camp Nichols, Rizal.
O744. White	Atlantic Gulf & Pacific Co., Manila.
O745. Studebaker	R. B. Lockwood, 1253 Pennsylvania.
O746. Ford	Mrs. Frank P. Thorton, 28 Manga Ave.
O747. Overland Roadster	Walter E. Hansheer, 60 Novaliches.
O748. Maxwell	Pastor Novicio, 1436 Misericordia.
O749. Everett	Herbert P. Linnell, 1259 M. H. del Pilar.
O750. Hupmobile	Da. Consuelo Roxas, 223 Concepcion.
O751. Overland	Wickham Quinan, 44 Manga Ave.
O752. Maxwell	Ceferino Cacnio, 1039 Dagupan.
O753. Franklin	F. R. Peria, 414 Isaac Peral.
O754. Briscoe	Luis R. de Arellano, 81 M. H. del Pilar.
O755. Trumbull	Ricardo A. Reyes, 305 Misericordia.
O756. Overland	Gregorio Valenzuela, 111 Bustillos.
O757. Panhard	Ricardo A. Reyes, 305 Misericordia.
O758. Hupmobile	City of Manila, Manila.
O759. Hupp Motor	Victoriano Siguenza, Molo, Iloilo.
O761. Overland	W. E. Olsen & Co., 27 Escolta.
O762. Peerless	Compania Gral. de Tabacos de Filipinas, 212 M. de Comillas.
O763. Overland	E. Lopez Mena, 914 Mabini.
O764. Hupmobile	Filomeno O. Gana, Biñan, Laguna.
O766. Maxwell	John Helbig, 2169 M. H. del Pilar.
O767. Brasier	Celedonio Bailon, 2147 Azcarraga.
O768. Hupmobile	Do.
O769. Renault	Do.
O770. Hupmobile	Jose Trinidad, 834 Rizal Ave.
O771. Ford	Federico E. Bona, Cervantes, Mountain Province.
O772. do	Miguel Cordevero, Capiz, Capiz.
O773. Overland	F. W. Towle, 911 Urbiztondo.
O774. Hudson	Lorenzo Perez, 232 Lardizabal.
O775. Berllet	Do.
O776. Overland	Edwin E. Tait, Olimpic Club, Manila.
O777. Hudson	Dr. Dario del Val. 37 Muralla.
O778. Dodge	Domingo Diaz, Tabaco, Albay.
O779. Pullman	Fred C. Hart, c/o U. S. S. "B–3" Cant.
O780. Reo	Juan Dominguez, Malolos, Bulacan.
O781. Dodge	J. D. Safford, Ft. McKinley, Y. M. C. A.
O782. Hudson	Vicente P. Genato, 629 Tanduay.
O783. Scout	Fritz Schad, 90 Rosario.
O784. Buick	Manila Gas Corporation, Manila.
O785. Hudson	Do.
O786. Buick	Dr. W. H. Boynton, Bur. of Agriculture.
O787. Pullman	M. Paske Smith, 234 Gral. Solano.
O788. Ford	Vicente Arias, 77 Gastambide.
O789. Hupmobile	Luis de Keyser, 123 Victoria.
O790. Dodge	Venancia de la Cruz, 329 Juan Luna.
O791. Hupp Motor	Benita Guidote Zarate, 814 Echague.
O792. Overland	Antonio A. Brimo, 724 Sta. Mesa.
O793. Buick	Potenciano Malvar, S. Pablo, Laguna.
O795. Dodge	Mario Guariña, Caloocan, Rizal.
O797. Studebaker	Solocan Development Co. Ltd., Manila.
O798. Hupmobile	Dr. Toribio Herrera, 1005 Melchorcano.
O799. Buick	Heh. Yasser, Cebu, Cebu.
O800. Dodge	Monica Garcia, 811 Folgueras.
O801. Paige	Peter Johnson, Cavite, Cavite.
O802. Ford	Hon. Jose Altavas, Capiz, Capiz.
O803. Panhard	Nestle Anglo Swiss Co., Sta. Cruz Bridge, Manila.
O804. Dodge	Mrs. F. C. Laing, 584 Peñafrancia.
O805. Hupmobile	Ceferino Vergel de Dios, Baliwag, Bulacan.
O806. Delahaye	Agustin Vergel de Dios, 1008 Benavides.
O807. Scripps Booth	Dr. Ramon Papa, 710 Evangelista.
O808. Cadillac	Manuel Araulio, 324 Legarda.
O809. Hudson	Antonio Pueo, 122 Arzobispo.
O811. Elcar	Dr. Jose Fabella, c/o Government Orphanage, Makati, Rizal.
O812. Hupmobile	Matsumoto Keisi, Calamba, Laguna.
O816. Studebaker	F. V. Barnes c/o Warner Barnes, Manila.
O817. Ford	Charles A. Clair, 537 Leroy.
O818. Oakland	Jose Velasco, 645 Soler, Manila.
O819. Panhard	Isidra Chanco, 248 Novaliches, Rizal.
O820. Buick	Pacific Commercial Co., Echague, Manila.
O821. Brasier	Mrs. Fachrling, 523 San Marcelino, Manila.
O822. Overland	Dr. Nicanor Jacinto, 102 Plaza Leon XIII, Manila.
O824. Dodge	C. H. Sleeper, Army and Navy Annet, Manila.
O825. Buick	Clemencia Blanco, 29 Sta. Mesa, Manila.
O826. Hupmobile	Do.
O827. Renault	Enrique Zobel, 501 L. Guerrero.
O828. Ford	Charles C. de Selnis, 30 Plaza Moraga, Manila.
O829. Brasier	A. Flores de Zamora, 123 Anda, Manila.
O830. Hupmobile	M. V. del Rosario, 347 Gral. Luna, Manila.
O831. Sunbeam	Horace L. Higgins, 848 Santol, Manila.
O833. Renault	Bernardino Sinjian, San Fernando, Pampanga.
O834. Hupmobile	Asiatic Petroleom Co. Ltd., Juan Luna.
O836. Buick	Alfonso Z. Sy Cip, 87 Tortuosa.
O837. Overland	Pedro B. Lagda, Kawit, Cavite.
O838. Hudson	Romana vda. de Martinez, 410 Peñarubia.
O839. Dodge	Mrs. A. Kingcome, 1111 M. H. del Pilar.
O840. Elcar	Teodoro y Gomez, 425 Ricafort.
O841. Brasier	Leonardo Osorio, 772 Sta. Mesa.
O842. Maxwell	Leonardo Osorio, 762 Sta. Mesa.
O843. Studebaker	Primo Villafranca, 722 Dakota.
O844. Dodge	N. S. Marshall, Pasay.
O845. Buick	Leogardo Azcarraga, 930 S. Fernando, Manila.
O846. Saxon	Hugo Rosenburg, 3 Brixton Hill.
O847. Overland	Vicente Villongco, Malabon, Rizal.
O848. Dodge	L. L. Espine, 812 R. Hidalgo.
O849. R. C. Hupp	Mathias Hansen, Dept. Hospital.
O850. Reo	Edgar A. McClellan, 226 San Anton.
O851. Dodge	Dr. Teofilo Villonco, 834 Ilaya.
O854. Maxwell	E. Molina, 407 Platerias.
O855. Dodge	Joseph P. Hailbronn, 606 Georgia.
O857. Ford	Perfecto Gabriel, 612 Trinidad.
O858. do	Sidney M. Morse, Manila Hotel.
O859. Dodge	Ramon Ongciaco, 725 Tabora.
O860. Ford	Tomas Mapua, 414 Ronquillo.
O861. Everett	Lucio Ongciaco, 725 Tabora.
O862. Overland	Benvenuto Cancio, Gerona, Tarlac.
O864. Hupmobile	Norberto Manikis, 632 Gandara.
O865. Overland	Joaquin Muñoz, Legaspi, Albay.
O868. Hupmobile	Jose Guevara, 848 Rizal Ave.
O869. do	Henry Levy, Manila.
O870. Ford	Roy H. Brown, Albay, Albay.
O873. Buick	Earnest Astell Kingcome, Guadalupe, Cebu.
O874. Ford	Irene Jaucian, Ligao, Albay.
O875. do	Edmond Slashim, Camp John Hay, Mountain Province.
O876. Overland	Chan Tek, Vigan, Ilocos Sur.
O877. R. C. H.	Fausto Nery Hnos., Cagayan, Misamis.
O878. Studebaker	Francisco A. Osorio, Cavite, Cavite.
O879. Hupmobile	Filedelfo de Leon, Vigan, Ilocus Sur.
O880. Overland	Ricardo C. Barretto, 145 Gral. Solano.
O881. Chalmers	Do.
O883. Buick	Santiago Lucero, Cabanatuan, Nueva Ecija.
O884. Overland	Radcliffe Johnson, Camp Wilhelm, Tayabas.
O886. Buick	Robert E. Manley, Naga, Ambos Camarines.
O888. Hudson	Felipe Buencamino, 159 Manga Ave.
O889. Ford	Robert Woodfine, 882 A. O'Donell, Manila.
O890. Overland	C. E. Atwood c/o Singer Sewing Machine Co.
O891. Dodge	Encarnación Gargolio vda. Tus, 384 Tanduay.
O892. Briscoe	Fermin Morales, 66 Escolta.
O894. Ford	Joaquin Ruis, 32 Alejandro VI, Manila.
O895. Hupp Motor	Do.
O896. Maxwell	Smith Bell & Co., Ltd., Hogar Filipino Bldg., Manila.
O897. Brasier	Henry Birkett, 93 Lamayan, Manila.
O898. Hupmobile	Ateneo de Manila, 145 Arzobispo.
O899. Brasier	Cresencio Tebullida, 905 Albuquerque.
O900.	E. J. Westerhouse, Pasay, Rizal.
O902. Hudson	Francisco Ycasiano, 1234 Sta. Elena.
O904. Ford	A. B. Parson, 567 Isaac Peral.
O905. do	Robert N, Murphy, 265 F. B. Harrison, Rizal.
O906. Hupmobile	Celso Ycasiano, 1234 Sta. Elena.
O907. Delahaye	Paz Cuyugan de Veloso, 300 Isaac Peral.
O908. Overland	P. B. Florence, 610 Legarda.
O909. Hupmobile	Exequiel Dizon, 121 Luzon, Manila.
O910. do	A. E. Mendoza, 650 Mabolo, Manila.
O911. Ford	R. F. Linnell, 1259 M. H. del Pilar.
O912. Scripps Booth	Jose Y. de Jesus, 900 Folgueras.
O913. Ford	Manuel Zamora, 913–15 R. Hidalgo, Manila.
O915. Hupmobile	Manuel Zamora, 917 R. Hidalgo, Manila.
O916. Renault	Teodoro de los Reyes, 2157 Azcarraga.
O917. Dodge	Maximino Paterno, jr., 917 R. Hidalgo.
O918. Renault	Carmen Ayala Vda. de Roxas, 7 Gral. Solano.
O919. Hupmoblie	Angel Garchitorena, 12 Nebraska.
O920. Hudson	Mariano Cui, Manila.
O921. Argo	Rev. Felipe Lumain, Tubigon, Bohol.
O923. Hupmobile	Claudio Gabriel, 63 Nagtahan, Manila.
O924. Ford	Clemente Chaves, Cagayan, Misamis.
O925. Hudson	L. McLaughlin, 221 Gral. Luna.
O927. Buick	Domingo Rodriguez, Talisay, Occidental Negros.
O928. Delahaye	Lorenzo de Villas, Sariaya, Tayabas.
O929. Buick	Luis Mirasol, 909 S. Fernando.
O930. Paige	Manuel B. Villanueva, 322 Requesens.
O934. Renault	Jose L. de Leon, Bacolor, Pampanga.
O935. Hudson	Vicente Soriano, 411 G. Tuazon.
O936. Buick	Padre Domingo Briones, Badiar, Cebu.
O937. Reo	Demetrio Sanchez, Laoag, Ilocos Norte.
O938. Ford	Frederick Karl, 1938 Misericordia.
O939. Hupmobile	Vicente Olmos, Guinobatan, Albay.
O940. Buick	Edwin Burk, 1120 Velasquez, Manila.
O941. do	Philippine Manufacturing Co., 1130 Velasquez.
O942. Hupmobile	Carmen Ayala Vda. de Roxas, 7 Gral. Solano.
O944. Renault	Sra. Barbara Bolos, 315 Azcarraga.
O945. Hupmobile	Pablo Clemente, Calamba, Laguna.
O946. Cadillac	Jose Cojuanco, Paniqui, Tarlac.
O947. Buick	Jose C. Vera, Camalig, Albay.
O949. do	M. Goldstine, 909 Indiana.
O950. Willys Knight	Tambunting de Legarda, 560 Reina Regente.
O951. Buick	Pedro Medina, Rosario, Cavite.
O952. Ford	Catalino Navarro, 2360 Herran.
O954. Overland	Carlos Ortiz, 70 Sta. Mesa.
O955. Hupmobile	Antonio P. Roxas, 21 Gral. Solano.
O956. Buick	Ruperto Anido, 753 Magdalena.
O957. Hupmobile	Antonio P. Roxas, Gral. Solano.
O958. S. Booth	M. Lauritsen, P. B., Manila.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O960. Buick	Mrs. T. J. Fox, 1026, Taft Ave.
O962. ......do	Thomas Rous, Manaoag, Pangasinan.
O963. Overland	Vicente Quintano, Malasiqui, Pangasinan.
O964. Dodge	P. B. Blackman, Dagupan, Pangasinan.
O967. Hupmobile	Dr. Rafael Perez, Silay, Occidental Negros.
O968. ......do	Felix Montenegro, Bais, Oriental Negros.
O969. Buick	Dr. A. T. Short, Zamboanga, Zamboanga.
O972. Renault	Venancio Rodriguez, Sariaya, Tayabas.
O973. Ford	Spencer G. Lane, Army & Navy Club, Manila.
O974. Hupmobile	Marciano Rivera, 416 Regidor, Manila.
O975. Partin Palmer	Carmelo Reyes, 720 Misericordia.
O976. Dodge	Severino B. Alberto, 672 Buenavista.
O977. F. C. H	Nicanor Padilla, 176 Rodriguez Arias. R. G. Murillo, Hotel Imperial. B. Yamada, Hotel Teferon.
O978. Hupmobile	Paz A. Legaspi, 976 Isaac Peral.
O979. Buick	Maximo M. Kalaw, 515 Peñafrancia.
O980. Maxwell	Ricardo Simmers y Garcia, 30 Sta. Mesa.
O981. Overland	Catalino Sevilla, San Miguel, Bulacan.
O984. Hupmobile	Antonio Vergel de Dios, 447 Evangelista.
O985. Overland	Ignacio Dychanco, S. Pablo, Laguna.
O986. Hupmobile	F. H. Hatrick, 2867 Herran.
O987. ......do	Manuel de los Reyes, Caloocan, Rizal.
O988. Dodge	Hon. Jose Hernaez, 1049 Oroquicta.
O990. Renault	Ricardo C. Barretto, 145 Gral. Solano.
O991. Ford	Luis Centenera, 37 Florida.
O992. Buick	Zamboanga Trans. Co., Zamboanga, Zamboanga.
O993. Chalmers	Do.
O994. Ford	Benito Gimenez Zoboli, Sta. Cruz, Laguna.
O995. Runabout	Walter G. Stevenson, 2641 Herran.
O996. Gabrielet	Do.
O997. Michell	Zamboanga Trans. Co., Zamboanga, Zamboanga.
O998. Buick	Luis Perez, 3 Nebraska.
O999. Dodge	Felipe Buencamino, jr., 152 Manga Ave.
O1000. Maxwell	Gabriel Felix, 303 Sto. Sepulcro.
O1001. Ford	Capt. Mauro Arlegui, 34 Divisoria, Manila.
O1002. Peerless	Leon Rosenthal, 400 Inverenes.
O1003. Hupp	Consuelo Saenz, 989 Sta. Mesa.
O1004. Ford	Robert Hartwigi 820 Mabini, Manila.
O1005. Buick	Amparo N. Lichauco, 427 Aviles.
O1006. Chandler	Pedro Buencamino, 549 Ave. Rizal.
O1007. Hupp	Ramon B. Genato, 852 R. Hidalgo.
O1008. Dodge	Angela Reyes, 1204 M. H. del Pilar.
O1009. Hudson	Jose Lim Chumbuque, 1009 Taft Ave.
O1010. Buick	Paula Lloret, 317 S. Marcelino.
O1011. Hudson	Norton & Harrison Co., Kneedler Bldg., Manila.
O1012. Buick	Martin F. Ramos, Calumpit, Bulacan.
O1013. Hupmobile	George Thrum, Sta. Mesa.
O1014. Elcar	J. O. C. Donelan, 48 Aviles.
O1015. Peerless	James Ross, Real, Manila.
O1016. Buick	W. S. Bramwell, 408 Aviles.
O1017. Little	A. Kaufman, 421 Misericordia.
O1018. Brasier	Cornelio Pineda, 2255 Juan Luna.
O1019. Dodge	Dalmacio Reyes, 55 Pereyra.
O1020. Maxwell	Leandro Gruet, 59 Plaza del Carmen.
O1021. Hupp	Agaton Cecilio, 736 Calero.
O1022. Studebaker	Mauricio Cailles, Nagcarlang, Laguna.
O1023. Dodge	Francisco Ortigas, 1131 Aceyteros.
O1024. Buick	Catalino Bernabe, Quingua, Bulacan.
O1025. Maxwell	D. M. Shaw, Meralco, Manila.
O1026. Wood's Mobilette	Philippine Islands Telephone & Telegraph Co., Plaza Lawton, Manila.
O1027. Ford	Pedro Domingo y Gomez, S. Pedro Makati, Rizal.
O1028. Buick	Dy Buncio, 406 Sto. Cristo.
O1029. S. Booth	Dr. Salvador J. Diy, 257 Lavanderos.
O1030. Cadillac	Ramon Ramos, 620 Mabini, Manila.
O1031. Hupmobile	Jose Francisco, 628 Herran.
O1032. Buick	Manuel Paras Mendoza, S. Fernando, Pampanga.
O1033. White	Joaquin Gonzales, Bautista, Pangasinan.
O1034. Overland	Miss Maria Tejico, 557 A. Mabini.
O1035. ......do	Tomas C. Reyes, S. Miguel de Mayumo, Bulacan.
O1036. Buick	Vicente Villanueva, 9 Tayuman.
O1037. Saxon	Antonio Barberan, Guinobatan, Albay.
O1038. Hupmobile	Dr. Arsenio Jimenez, Jaro, Iloilo.
O1039. Cadillac	Dr. Shannon Richmond, Albay, Albay.
O1040. Ford	Baldomera Garcia, Guinobatan, Albay.
O1041. Buick	Engracio de Asis, 1339 Azcarraga.
O1042. ......do	Richard Allen, 413 Dakota.
O1043. ......do	G. M. Clevenger, Los Baños, Laguna.
O1044. Briscoe	C. Lozano, 41 Alejandro VI.
O1045. Buick	Asuncion Nable, 247 Aviles.
O1046. Delahaye	Ramon Zaragoza, 1046 R. Hidalgo.
O1047. Ford	Gervasio de Ocampo, 1047 Arlegui.
O1048. Buick	Sebastian Sunico, 503 Jaboneros.
O1049. Overland	M. N. de Lange, 333 Sulucan.
O1050. ......do	Eutiquiano Garcia, Mexico, Pampanga.
O1051. Hupmobile	Vda. y Herederos de G. Locsin, Silay, Occidental Negros.
O1052. Minerva	Jose Ma. Tuazon Gil de Sola, 815 Dart.
O1053. Renault	Do.
O1054. Overland	Fortunato Tanjutco, Hagonoy, Bulacan.
O1055. Hupmobile	Sixto Castello.
O1056. Dodge	Vicente B. Gamboa, Silay, Occidental Negros.
O1057. Overland	Matias Hilado, Bacolod, Occidental Negros.
O1058. Ford	Charles A. Robertson, 507 Sto. Sepulcro.
O1059. Brasier	Vicente Madrigal, 274 Alhambra.
O1060. Ford	Berry's Garage, 248 Cabildo.
O1061. Baby Peugot	Do.
O1062. Hupmobile	Angel Vargas, Iloilo, Iloilo.
O1063. Chalmers	Rufino C. Domingo, 1018 Melchorcano.
O1064. Dodge	Manuel G. Velasquez, Aliaga, Nueva Ecija.
O1065. Hupmobie	Dr. Meliton Solano, Tabaco, Albay.
O1066. ......do	Monico Barrameda, Bacacay, Albay.
O1067. Reo	Oscar Fader, 337 Paz.
O1069. Buick	Sixto Castro, 175 Lipa, Manila.
O1070. Overland	F. H. Sargent, Ft. McKinley, Rizal.
O1071. Buick	E. E. White, 408 Aviles.
O1072. Overland	Leon Bouson, Dao, Capiz.
O1073. Dodge	Jose de Luzuriaga, Iloilo, Iloilo.
O1074. Hupmobile	Antonia Lijanco, Sta. Rosa, Laguna.
O1075. Ford	Manuel L. Lopez, 15 Alejandro VI.
O1076. Reo	Maria Lechuga, Malolos, Bulacan.
O1077. Hupmobile	Enrique R. de la Cruz, Bulacan.
O1078. Buick	Leonarda R. Cruz, Bustos, Bulacan.
O1079. Hupmobile	F. M. Yaptico & Co., Victoria, Occidental Negros.
O1080. ......do	Manila Rail Road Co., Legaspi, Albay.
O1081. Ford	Antonio Monfort, Cadiz, Occidental Negros.
O1082. Overland	Ambrosio Valero, S. Rafael, Bulacan.
O1083. Buick	Juanita Legaspi, 816 S. Nicolas, Manila.
O1084. Dodge	Nicanor Gregorio, 135 Herran.
O1085. Hupmobile	Domingo Antonio, 752 Magdalena.
O1086. Ford	Bureau of Customs, Manila.
O1087. Hupmobile	Gotanco y Compania, 214 Soler.
O1088. Overland	R. Nolan, Bacolod, Occidental Negros.
O1089. Studebaker	The Tayabas Land Co., 614 Alvarado.
O1090. Hupmobile	Alexander Yuill, 657 Sta. Mesa.
O1091. Buick	Nicolas Grageda, Camalig, Albay.
O1092. Oakland	Ricardo Nolan, Bacolod, Occidental Negros.
O1093. Chandler	Joaquin Zamora, 604 Sales.
O1094. Hudson	Lichauco & Co., Inc., 117 Dasmariñas.
O1095. Ford	Fructuoso Angeles, Sta. Cruz, Laguna.
O1096. Dodge	Benito Simson, 990 M. H. del Pilar.
O1097. ......do	Arlington Pond, Camp Stotsenburg, Pampanga.
O1098. Oakland	Dr. Benito Valdez, 964 R. Hidalgo.
O1099. Buick	Mrs. E. F. Rowlands, 718 Indiana.
O1100. Maxwell	S. Murray, 175 Juan Luna.
O1101. Oakland	Carlos Pardo de Tavera, 714 Echague.
O1102. Studebaker	Verne N. Miller, 536 Colorado.
O1103. Ford	Geo. W. Dunlap, Cebu, Cebu.
O1104. Buick	G. S. Yuill Co., 503 Echague.
O1105. Studebaker	Antonio Casas, Macabebe, Pampanga.
O1106. Dodge	Teodoro Velez, Cebu, Cebu.
O1107. Hupmobile	A. P. Drakeford, 706 A. Mabini.
O1108. ......do	Mariano Aguilar, Hinigaran, Occidental Negros.
O1109. S. Booth	John Shepard, Dept. Q. M., Manila.
O1110. Hupmobile	Jose La O, 214 Tetuan.
O1111. Overland	Henry Herman, 331 S. Rafael.
O1112. ......do	Joseph V. House, Tacloban, Leyte.
O1113. Ford	Severino Tanalega, Poblacion, Bay, Laguna.
O1114. Buick	John Northcott, Manila.
O1115. Monroe	Joseph L. Beach, 908 Indiana.
O1116. Interstate	Tomas Sy Quia, Vigan, Ilocos Sur.
O1117. Hupmobile	H. F. Streegan, 716 Dakota.
O1118. Ford	Esteban Buenviaje, Oas, Albay.
O1119. ......do	Isidoro Aragon, 111 Singalong.
O1120. ......do	Julian La O, 212 Espeleta.
O1121. Oakland	Benito Ullman, 764 Soler.
O1122. Brasier	Eulalia V. Vda. de la Rama, 601-607 Colorado.
O1123. Hudson	Do.
O1124. Hupmobile	Milton E. Springer Co., Plaza Sta. Cruz.
O1125. Buick	Dr. Salvador del Rosario, Manila.
O1126. ......do	Rev. Bonifacio de la Cruz, Pulilan, Bulacan.
O1127. ......do	Florencio Castañeda, 197 G. Tuazon.
O1129. ......do	Felipe de la Fuente, 662 Evangelista.
O1130. Panhard	Do.
O1131. Dodge	Hon. Matias Gonzales, Bautista, Pangasinan.
O1132. Saxon	Jacobo Paterno, 453 P. Gomez.
O1133. Buick	Do.
O1134. Hudson	Adelaida Paterno, 453 P. Gomez.
O1135. Dodge	Atilano G. Mercado, Mexico, Pampanga.
O1136. Overland	Norton & Harrison Co. Kneedler Bldg., Manila.
O1137. Ford	Do.
O1138. Saxon	Vicente Bautista, 83 Gral. Luna.
O1139. Delahaye	Eugenio Del-Sas-Orozco, 227 Arquiza, Manila.
O1140. Dodge	Gregorio Borromeo, Mabajao, Misamis.
O1141. Hupmobile	Do.
O1142. ......do	Do.
O1143. Dodge	J. Lino Luna, 1656 Ave. Rizal.
O1144. Chevrolet	Silvestre Bautista, 1338 Juan Luna.
O1145. Buick	Elmar Madsen, P. C. Co., Manila.
O1146. Ford	Pedro N. Enrique, 470 Padre Rada.
O1147. Regal	A. T. Hohener, 111 Valenzuela.
O1148. Waverly	Francisco Gutierrez, 827 M. H. del Pilar.
O1149. Maxwell	Col. Richard Donovan, 14 Pasage del Carmen.
O1150. Chandler	Daniel Tirona, Cavite, Cavite.
O1151. Mitchell	Jose Ayala, 814 Echague.
O1152. Hudson	Isidro Herrera, Tiaong, Tayabas.
O1153. Overland	James M. Underwood, Mandaluyong, Rizal.
O1154. Dodge	Tiburcio Medina Cue, 367 Juan Luna.
O1155. ......do	Lieut. Rafael L. Garcia, Ft. Hills, Corregidor.
O1156. Everett	Mr. C. G. de Arce, 2268 Azcarraga.
O1157. Studebaker	Catalino Sevilla, S. Miguel, Bulacan.
O1158. Brasier	Jose R. Francisco, 832 O'Donell.
O1159. Studebaker	Catalino Reyes, 1345 Ave. Rizal, Manila.
O1160. Dodge	Mariano Lim, 733 Sto. Cristo, Manila.
O1161. Buick	Ramon F. Rios, Rosario, Cavite.
O1162. ......do	Dr. Antonio Agoncillo, Batangas, Batangas.
O1163. Panhard	Hon. Cayetano Arellano, 227 Gral. Luna, Manila.
O1164. Ford	Sra. S. Bernart de Arellano, 277 Gral. Luna.
O1165. Dodge	F. Cariacos, Tagbilaran, Bohol.
O1166. Studebaker	W. Fredlander, 626 Sta. Mesa.
O1167. Maxwell	Mariano Tuason, 6 Manga Ave.
O1168. Dodge	Emilio G. Mapua, 243 Buenavista, Manila.
O1169. E. M. F	Jose Machuca, 21 Balmes.
O1170. Dodge	Manuel Tinio, Talavera, Nueva Ecija.
O1171. Ford	J. W. Jones, Dimas-Alang, Manila.
O1172. Everitt	R. B. Gibson, St. Anthony Hotel, Manila.
O1173. Hupmobile	Valeria Ladesma, Jaro, Iloilo, Iloilo.
O1174. ......do	D. Sixto Castelltort, 1134 Misericordia, Manila.
O1175. Ford	Dr. Gaudencio Gonzales, Tanauan, Batangas.
O1176. Hupmobile	Sra. Jacoba Garcia, Batangas, Batangas.
O1177. Ford	Alfredo L. Guerrero, 117 A. Mabini, Manila.
O1178. Saxon	Francisco Such, 415 Soler, Manila.
O1180. Buick	Pacific Commercial Co., Echague, Manila.
O1181. Chandler	Mrs. C. W. Rosenstock, 1004 Taft Avenue.
O1182. King	Marciano Rivera, 416 Regidor, Manila.
O1183. R. C. M	Amadeo Romanach, 955 R. Hidalgo, Manila.
O1184. Dodge	Gregorio G. Gabuniag, Candelaria, Tayabas.
O1185. Waverly	Jose N. Wolfson, 65 P. Cervantes, Manila.
O1186. Maxwell	Galo Lichauco, 436 Tanduay, Manila.
O1187. Overland	J. B. Cooley, S. N. Penal Farm, Zamboanga.
O1188. Dodge	Messrs. Ampil & Co. 514 Aviles, Manila.
O1189. Sunbeam	William Swann, Manila Club, Manila.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O1190. Buick	Tomas Sunico, 904 Wright.
O1191. Hupmobile	Martin C. Dionicio, Malabon, Rizal.
O1192. Renault	Henry George, 118 T. Pinpin, Manila.
O1194. Oakland	Jose Fernando Rodrigo, Bulacan, Bulacan.
O1195. Dodge	Sebastian S. Reyes, Plaza de Rizal, Pasig, Rizal.
O1196. Hupmobile	E. C. Barnes, Pasay, Rizal.
O1197. do	Joaquin Perez, 320 Gral. Luna, Manila.
O1198. Fiat	Ana Maria Alcantara, 320 Gral. Luna, Manila.
O1199. S. Booth	Joaquin Perez, 320 Gral. Luna, Manila.
O1200. Buick Norman	G. Campion, Canlubang, Laguna.
O1201. Overland	Casimiro Peña, Gral. Luis, Int. Caloocan, Rizal.
O1202. Maxwell	Do.
O1203. Brush	Do.
O1204. do	Do.
O1205. Hupmobile	Albino Jison, Silay, Occidental Negros.
O1206. Overland	Lope de los Santos, Caloocan, Rizal.
O1207. Chandler	Simmie & Grilk, Manga Ave.
O1208. Ford	Luzon Brokerage Co. Sa. Fernando, Manila.
O1209. do	Do.
O1210. Reo	Leonor Reyes, 602 Alvarado, Manila.
O1211. Trumbull	Luzon Brokerage & Co. San Fernando, Manila.
O1212. Studebaker	Geo Simmic, Manga Ave., Manila.
O1213. Hupmobile	Simmie & Grilk, Capt. Post Bldg. Manila.
O1214. Hudson	Geo W. Simmic, Manga Ave., Manila.
O1215. Hupmobile	Ton Nicol, Delmonico Hotel, Manila.
O1216. King	G. P. Silkirk, Sambag, Cebu.
O1217. Ford	Cecilio Sanchez, Alegria, Cebu.
O1218. do	H. S. King, 175 Marquez de Comillas, Manila.
O1219. do	A. A. Bryan, Cebu, Cebu.
O1220. Maxwell	Gavino Singuimoto, Batangas, Batangas.
O1223. Overland	Philippine Islands Telephone and Telegraph Co., Plaza Lawton, Manila.
O1224. Buick	H. Hakayawa, Baguio, P. I.
O1225. Ford	Andres Jacinto, Malolos, Bulacan.
O1226. Studebaker	Miguel Paredes, Dagupan, Pangasinan.
O1227. Maxwell	Maximo Cuesta, Lingayen, Pangasinan.
O1228. Hupmobile	Margarita R. Vda. de Soriano, Calauan, Laguna.
O1229. Dodge	Luis Gomez, Bautista, Pangasinan.
O1230. Buick	Luzon Rice Mills Co., Calumpit, Bulacan.
O1231. Maxwell	Benigno Goitia, 619 San Nicolas, Manila.
O1232. Buick	Gregorio Limjoco, P. Zamora, Batangas.
O1233. Overland	Dr. Cezar Mercader, Gibumanjug, Cebu.
O1234. Reo	Manuel Lopez Castolo, 932 Singalong, Manila.
O1235. Dodge	Rosario Tiama, Jolo, Sulu.
O1236. Maxwell	L. W. Corson, Jolo, Sulu.
O1237. do	Wm. A. Kincaid, Manila Hotel, Manila.
O1238. Overland	Nicolas E. Barretto, 714 Sanchez.
O1239. do	Hawaiin Sugar Planters' Association, 136 San Nicolas, Manila.
O1240. Buick	Pablo de Jesus, 1384 Felix Huertas, Manila.
O1241. Overland	Jose R. Pomar, 100 Real, Manila.
O1242. Dodge	Belen Mauricio, 577 Tanduay, Manila.
O1243. Hupmobile	Estanislao Cloto, Aparri, Cagayan.
O1244. King	Simeon Blas, Malabon, Rizal,
O1245. Ford	James S. Wilson, Int. McKinley, Rizal.
O1246. Briscoe	John J. Russell, 7 Nagtahan, Manila.
O1247. Hudson	Demetrio Tuazon, 1022 R. Hidalgo, Manila.
O1248. Buick	Santiago Gochangco, 22 Villaroel, Pasay, Rizal.
O1249. do	Demetrio Tuazon, 1022 R. Hidalgo, Manila.
O1250. Hudson	W. H. Lawrence, Pasay, Rizal.
O1251. Ford	Caddelt Elliot, 306 Masonic Temple, Manila.
O1253. Overland	Gabriel La O, 8 Brixton Hill.
O1254. do	Ramon B. Neri, Cagayan, Misamis.
O1255. do	Stark & Company, 120 Dasmariñas, Manila.
O1256. Studebaker	Frank A. Anderson, 921 Wright, Manila.
O1257. Dodge	H. A. Keller, 1050 Santol, Manila.
O1258. Hupmobile	Julian Salgado, 825 Ongpin, Manila.
O1259. Buick	Jose Miranda San Pedro, Ulilang Cawayan, Manila.
O1260. R. C. H	Mrs. M. L. Rocha, 324 P. Gomez, Manila.
O1261. Renault	Rafael Reyes, 205 San Rafael, Manila.
O1262. Cadillac	Do.
O1263. C. Bayard	Carlos P. de Tavera, 1068 R. Hidalgo, Manila.
O1264. Brasier	Julian Concepcion, 1048 Castillejos, Manila.
O1265. Dodge	Maximo Rodriguez, Lucena, Tayabas.
O1266. Buick	Ramon P. Herrera, San Fernando, Pampanga.
O1267. Overland	Exequiel P. Valdez, Lingayen, Pangasinan.
O1268. Hupmobile	Epifanio de los Santos, Malolos, Bulacan.
O1269. Willy's Knight	Mrs. Juliana Israel, 19 Pasage del Carmen.
O1270. Dodge	Jacinto Geronimo, Candaba, Pampanga.
O1271. Little	Dr. Julio Layug, Lubao, Pampanga.
O1272. Buick	Manuel E. Cuyugan, 130 M. H. del Pilar, Manila.
O1273. Maxwell	Josefina Vda. de Larena, Bais, Oriental Negros.
O1274. Ford	Dr. J. L. Booth, Zamboanga, Zamboanga.
O1275. Studebaker	Josefina Vda. de Larena, Bais Oriental Negros.
O1276. Maxwell	Mariano Velasco, & Co. 130 Nueva, Manila.
O1277. Delahaye	Jose Gorastiaga, 630 Peñafrancia, Manila.
O1278. Brasier	Timoteo Morlo, 2495 Herran, Manila.
O1279. Buick	Gregorio Araneta, 1030 R. Hidalgo, Manila.
O1280. Dodge	Do.
O1282. King	O. M. Shuman, 119 Cortada.
O1283. R. C. H	N. R. Stewart, 227 Buenavista.
O1284. Dodge	Vicente I. Alberto, 672 Benavidez, Manila.
O1285. Buick	W. H. Haydon, 711 Wright, Manila.
O1286. Empire	Baldomero Fernandez, 881 Isaac Peral, Manila.
O1287. Maxwell	Antonio Herrero, Florida Blanca, Pampanga.
O1288. Dodge	A. Sing, 41 Escolta, Manila.
O1289. Chevrolet	Alfredo Javier, 548 Salcedo.
O1290. Luger	Jose Ma. Tuazon, 1022 R. Hidalgo.
O1291. Buick	H. B. Pond, Pacific Com. Co.
O1292. Oakland	Levy Hermanos, Iloilo, Iloilo.
O1293. Dodge	Gral. G. Clifford, Bank of the Philippines, Manila.
O1294. Brasier	James Hill, Dagupan, Pangasinan.
O1295. Ford	A. M. Burton, Bureau of Agriculture.
O1296. Brasier	A. J. Rosario, jr. 523 Aviles.
O1297. Ford	Jose Elchico, 513 Lavezares.
O1298. Hupmobile	Manuel Borja, Malabon, Rizal.
O1299. Maxwell	Jaime A. Rosario, 523 Aviles.
O1300. do	H. C. Liebeneo, 1331 Pennsylvania.
O1301. Overland	Chas G. Saill, Manila.
O1302. Ford	Jose Francisco, 628 Herran.
O1303. Dodge	John E. Barker, Elks Club, Manila.
O1304. Ford	Tomas del Rio, 334 Vito Cruz.
O1305. do	Hugo H. Miller, 322 San Gregorio.
O1306. Hupmobile	Antonio Luancing, Mabini, Rosario, Batangas.
O1307. Overland	K. Matsumoto, Manila Hotel.
O1308. Studebaker	E. E. Elser, 437 Looban.
O1309. Hupmobile	Tomas Wilson, 340 Lamayan.
O1310. Overland	Tan Congco, 513 Pinpin.
O1311. do	Connell Bros. Co., 110 Echague.
O1312. Brasier	Isabel G. Vda. de Tuazon, 18 Gral. Luna.
O1313. Saxon	R. Oriol & Co., 519 Rizal Ave.
O1314. Maxwell	Wm. Crooks, Cebu, Cebu.
O1315. Ford	E. Finley Johnson, Pasay, Rizal.
O1316. Reo	Do.
O1317. Hudson	Lorenzo Deblois, 159 M. H. del Pilar.
O1318. Overland	Alvaro Pastor, Cebu, Cebu.
O1319. Ford	Rafael H. Ramos, 811 Taft Ave.
O1320. Cadillac	G. Martini, Muelle de la Industria.
O1321. Hudson	Do.
O1322. Buick	Silvino Lim, 322 Sto. Cristo.
O1323. Hupmobile	Jose M. Cajucom, Cabanatuan, Nueva Ecija.
O1324. Dodge	Felino Cajucom, Cabanatuan, Nueva Ecija.
O1325. Reo	Doria Poli, Manila Hotel.
O1326. Paige	Do.
O1327. Buick	Pablo Ventura, 112 Plaza Miranda.
O1328. Maxwell	J. S. Beecher, U. S. Navy Yard, Cavite.
O1329. Everitt	Jose de la Rama, Bacolod, Occidental Negros.
O1330. Dodge	Pedro Cruz, 310 Echague.
O1331. Hudson	Demetrio Tuazon, R. Hidalgo.
O1332. Ford	M. A. Rader, 259 Gral. Luna.
O1333. Hudson	Gregorio Oligario, 763 Sto. Cristo.
O1334. Hupmobile	Francisco Enage, 814 Indiana.
O1335. Reo	Mons. Joseph Petrelli, 1195 M. H. del Pilar
O1336. Minerva	Angeles V. vda. de G. Suarez, 58 Legaspi.
O1337. Dodge	Candido Fanlo, 22 Isaac Peral.
O1338. Buick	Jose S. Hilario, 619 Kansas.
O1339. Chalmers	Amado C. Malay, 1872 Juan Luna.
O1340. Buick	Jose Rubio, 214 David.
O1341. Briscoe	Isabelo Andres, 416 M. H. del Pilar.
O1342. Interstate	Rev. Jose Algué, Weather Bureau, Manila.
O1343. Dodge	Y. J. Goyena, 2232 Felix Huertas.
O1344. Buick	H. H. Beisner, Pasay, Rizal.
O1345. Dodge	Vicente Tobias, Sta. Cruz, Laguna.
O1346. Renault	Geo. H. Fairchild, Pasay, Rizal.
O1347. Overland	Yovito Baldovino y Pande, Tayabas, Tayabas.
O1348. Renault	Tomas Arguelles, 2 Brixton Hill, Manila.
O1349. Hudson	Do.
O1350. Dodge	Leopoldo Criado, 15 Nebraska.
O1351. Studebaker	Juan de Leon, 78 Isnart, Iloilo, Iloilo.
O1352. Dodge	Jacinto Molina, Bulacan, Bulacan.
O1353. Hupmobile	Maria Yparraguirre, 1175 M. H. del Pilar.
O1354. Panhard	Margarita Quintos, 1175 M. H. del Pilar.
O1355. Hupmobile	Justo Cuaycong, Saravia, Occidental Negros.
O1356. do	Vivencio A. Villegas, 1120 Azcarraga.
O1357. Chalmers	Mrs. J. E. Ainsworth, 5 Cortabitarta.
O1358. Buick	F. Liongson, 204 Nebraska.
O1359. Hupmobile	Ramon Avanceña, 812 Indiana.
O1360. Oakland	Miguel Mut, 217 Solana.
O1361. Maxwell	Maximino Muna, 745 Elcano.
O1362. Buick	Ramon Salinas, Manila.
O1363. Ford	Jose Bocanegra y Simo, Bais, Oriental Negros.
O1364. Overland	Juan Larrabaster Achondo, Bais, Oriental Negros.
O1365. Ford	N. M. Saleeby, 15 P. Faura.
O1366. Overland	Felipa Pineda, 1949 Juan Luna.
O1367. Hupmobile	B. A. Sison, 103–109 S. Marcelino.
O1368. Brasier	Dalmacio Olegario, 58 Sandejas, Pasay.
O1369. Buick	I. Beck, 494 Peñafrancia.
O1370. Maxwell	Sinliong Co., Iloilo, Iloilo.
O1371. Cadillac	Mrs. S. Feldstein, 938 Herran.
O1372. Dodge	Fermin Caram, Real, Iloilo, Iloilo.
O1373. Studebaker	Isabel Arraneta, Molo, Iloilo.
O1374. R. C. H	Celedoña Samzon, Molo, Iloilo.
O1375. Hupmobile	Dionisio Insa, 31 Progreso, Iloilo.
O1376. Ford	Dr. Benedicto Adorable, Gapan, Nueva Ecija.
O1377. Dodge	Aniceto Ruis, 233 Carriedo, Manila.
O1378. Ford	M. B. Arroyo, Molo, Iloilo.
O1379. Oakland	Dr. O. Hashimoto, 44 Iznart, Iloilo.
O1380. Hudson	Guillermo Gomez, Iloilo, Iloilo.
O1381. Ford	R. C. Thomas, Iloilo Iloilo.
O1382. Hudson	Jose Araneta, Iloilo, Iloilo.
O1383. Roadster	Do.
O1384. Overland	Judge Julio Llorente, Lingayen, Pangasinan.
O1385. R. C. H	Do.
O1386. Maxwell	Welch Fairchild Co., Inc., Roxas Building, Manila.
O1387. Overland	Mrs. F. Mendoza, 157 Metrica, Manila.
O1388. Studebaker	Vicente Rustia, Baliwag, Bulacan.
O1389. Hudson	Justo Rustia, Baliwag, Bulacan.
O1390. Buick	Mamerto Hugo, 410 Ronquillo.
O1391. do	Juan Fajardo, 640 Ave. Rizal.
O1394. Overland	Ireneo Magpantay, 1928 Juan Luna.
O1395. Ford	Major Felix Llorente, Albay, Albay.
O1396. Overland	Faul Meller, 800 Wright.
O1397. Dodge	Padre Braulio Pineda, Sta. Rita, Pampanga.
O1398. Overland	Manila Trading Co., 155–159 Escolta.
O1399. Monreo	Do.
O1400. Ford	H. E. S. Thomas, 306 S. Luis, Manila.
O1401. Dort	Lewis H. Dingman, Sta. Cruz Fire Station.
O1402. S. Booth	Jose Nepomuceno, 110 P. Goite.
O1403. E. M. F	Do.
O1404. Buick	Marcelo J. Boncan, 720 Benavides
O1405. Overland	A. O. Gerner, 325 Echague.
O1406. Buick	Ruperto Anido, 753 Magdalena.
O1407. Opel	J. J. Gordon, Olongapo, Zambales.
O1408. Renault	Filomena Concepcion, 741 Benavides.
O1409. Dodge	Do.
O1411. Studebaker	Abraham Abad, 321 San Gregorio, Paco, Manila.
O1412. Brasier	Leon Samia, 538 Laguna, Manila.
O1413. Maxwell	Anastacio Teodoro, 727 S. Marcelino.
O1414. do	Alfredo L. Guerrero, 117 A. Mabini.
O1415. Hupmobile	Dr. Ramon G. Romasanta, 537 Elcano.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O1416. Ford	John Bach, 185 M. de Comillas.
O1417. Chalmers	Dr. Eliceo Santos, 14 Gral. Solano.
O1418. Studebaker	Lt. Col. Edwin W. Rich, Camp Stotsenburg, Pampanga.
O1419. Buick	Catalino Arevalo, 2972 Herran.
O1420. Renault	Leon Samia, 335 Laguna.
O1421. Reo	Captain Geo. M. Shekton, P. S. Camp McGrath, Batangas.
O1422. A. Detroit	G. P. Otis, Pasig, Rizal.
O1423. Hupmobile	Sixto S. Sandejas, 610 Looban.
O1424. Hudson	Robert Dichie, S. Jose, Ambos Camarines.
O1425. Buick	Horace G. Reed, Chaco Building, Manila.
O1426. Dodge	Dr. W. A. McVean, 422 Kneedler Building, Manila.
O1427. Ford	K. W. Bean, 210 Buenavista.
O1428. Peugeot	Ramon Soriano, 327 Elcano.
O1429. Panhard	Doroteo Sevilla, 327 Elcano.
O1430. Maxwell	J. A. Pietsch, Lutz & Co., Manila.
O1431. Hudson	James R. Redfern, 90 Rosario.
O1432. Buick	P. Linton E. Ex. Telegraph Co., Manila.
O1433. S. Booth	Captain H. H. Kennard, Camp Stotsenburg, Pampanga.
O1434. Reo	U. del Polu, 442 Gral. Luna.
O1435. Ford	Manuel A. Gonsales, Rosales, Pangasinan.
O1436. Overland	Do.
O1437. C. Bayard	Do.
O1438. Hudson	Casamiro Yapco, 1140 Aceyteros.
O1439. Dodge	Quintin Paredes, 449 Peñafrancia.
O1440. Overland	G. R. Mateo, 24 Escolta.
O1441. Buick	Pacific Commercial Co., Legaspi, Albay.
O1442. Ford	F. J. L. Villamil, Dagupan, Pangasinan.
O1443. Buick	Gregorio Salvador, 532 P. Herrera.
O1444. ....do	Chan Aji, 325 Sto. Cristo.
O1445. Ford	Bonwitt Teller & Co., 20 Nagtahan.
O1446. Overland	B. Diaz, 563 Legarda.
O1447. Dodge	D. M. Fabella, Cebu, Cebu.
O1448.	Leona Sinson, Vigan, Ilocos Sur.
O1449. ....do	Reginold Kerr, 17 Pasage del Carmen.
O1450. Studebaker	Jose P. Paterno, 115 Villalobos.
O1451. Buick	Do.
O1452. Hupmobile	Dr. Bernardo Samzon, Candaba, Pampanga.
O1453. Overland	J. Gil Medel, 15 Concepcion, Pasay, Rizal.
O1454. Buick	M. E. Cleland, Cebu, Cebu.
O1455. Renault	Mariano Alimurong, Bacolor, Pampanga.
O1456. Overland	James C. Sloan, Sambog, Cebu.
O1457. Buick	Cang Suco & Brothers, 18 Commercio, Cebu.
O1458. ....do	Ramon Aboitis, Cebu, Cebu.
O1459. Hupmobile	Jose & Inocencio Delgado, San Pablo, Laguna.
O1460. Ford	Telesforo Florido, Dalaguete, Cebu.
O1461. Studebaker	H. D. Kneedjer, 910 A. Mabini.
O1462. Hupmobile	Federico Montinola, Bago, Occidental Negros.
O1463. Studebaker	Calamba Sugar State, Canlubang, Laguna.
O1464. Hudson	Manuel V. Moran, Lingayen, Pangasinan.
O1465. Empire	R. K. Netherland, Bayambang, Pangasinan.
O1466. Overland	Rev. P. Ubaldo Enriquez, Samboan, Cebu.
O1467. Brasier	Max. B. Solis, Sariaya, Tayabas.
O1468. Buick	W. E. Olsen & Co., 27 Escolta.
O1469. Hupmobile	Nicolas Claguivel, Lipa, Batangas.
O1470. Cadillac	C. O. Harbaugh, 105 Duque de Alba, Manila.
O1471. Overland	Juana Sulit, 315 Regidor.
O1472. Hupmobile	Carlos Kipping, Camiling, Tarlac.
O1473. Smith	Antonio Manuel, 10 Callejon Esperanza.
O1474. Ford	Julian De Court, Capt. Camp MacGrath, Batangas.
O1475. Partian Palmer	R. C. France, 158 Juan Luna.
O1476. Overland	Clemente L. Oliver, 1511 Franco.
O1477. Buick	Mariano J. Jocson, 481 S. Anton.
O1478. Chalmers	Lt. Col. Simplicio de los Santos, Philippine National Guard.
O1479. Ford	Daniel Paras, 263 Florida.
O1480. ....do	Angel Calvo, 930 M. H. del Pilar.
O1481. Delahaye	Do.
O1482. Buick	Dionisio Calvan, Bautista, Pangasinan.
O1484. ....do	A. N. Jureedini, 320 S. Gregorio.
O1485. Studebaker	Maj. Ode C. Nichols, Cuartel de España.
O1486. Buick	William F. Daland, 77 Nagtahan.
O1487. Hupmobile	Augusto Asabedo, 516 Jaboneros.
O1488. R. C. H	Moreno Jabibi, 42 Escolta.
O1489. Hupmobile	H. H. Bayne, 918 Wright.
O1490. Maxwell	Juan Nolasco, 9 Quezada.
O1491. Overland	Gregorio Reyes, 2020 Oroquieta.
O1492. Renault	Matias Gonzales, Bautista, Pangasinan.
O1493. Hupmobile	F. Jose, 252 Concepcion.
O1494. Studebaker	Richard Taovey, Macondray & Co., Pasay.
O1495. Overland	F. E. Glazeworth, 980 Sta. Mesa.
O1496. ....do	Dr. Jose C. Locsin, Silay, Occidental Negros.
O1497. Brasier	Jose Ledesma, Silay, Occidental Negros.
O1498. Hupmobile	Delfin Ledesma, Silay, Occidental Negros.
O1499. Buick	Jose Ledesma, Silay, Occidental Negros.
O1500. Chandler	Julian Salgado, 825 Ongpin.
O1501. Ford	Asiatic Petroleum Co., 28 Juan Luna.
O1502. Dodge	Lt. Col. Willis V. Morris, 9 Plaza Militar.
O1503. Hupmobile	Silverio de Cocillo, Naga, Ambos Camarines.
O1504. Buick	Lorenzo Castillo, Saravia, Occidental Negros.
O1505. Saxon	R. B. Commans, 172 Benavides.
O1506. Overland	Francisco J. Rivers, Sta. Rosa, Laguna.
O1507. Studebaker	Higinio Benitez, Pagsanjan, Laguna.
O1508. Little	Francisco Beech, 267 S. Marcelino.
O1509. Overland	Do.
O1510. Studebaker	Manuel L. Quezon, Sta. Ana, Manila.
O1511. Peugeot	Roberto Martinez, 257 Cabildo.
O1512. Overland	Salvador C. Imperial, Albay, Albay.
O1513. Hudson	Juan Martinez, 257 Cabildo.
O1514. Brasier	Do.
O1515. Overland	Enrique Quema, Vigan, Ilocos Sur.
O1516. Minerva	Mrs. Adela C. Baldwin, Muntinlupa, Laguna.
O1517. Smith	Vivencio Cruz, Mariquina, Rizal.
O1518. Cadillac	Manuela Vda. de Mansana, 543 Tanduay.
O1519. Saxon	Miguel Basilio, 1099 Singalong.
O1520. S. Booth	Emilio Gonzales Lao, 51 L. Guerrero.
O1521. Hudson	Antonio Bautista, Malolos, Bulacan.
O1522. Ford	Bertel Skow, 95 Escolta.
O1523. Buick	Emilia Aboitiz, 413 L. Guerrero.
O1524. Maxwell	Teodoro Donato, Vigan, Ilocos Sur.
O1525. Ford	E. A. Weber, Tuguegarao, Cagayan.
O1526. Hudson	Dr. Jose Lopez Villanueva, Silay, Occidental Negros.
O1527. Overland	Salustiano de la Rama, Bacolod, Occidental Negros.
O1528. Cadillac	Antero Montinola, La Carlota, Occidental Negros.
O1529. Hupmobile	Dr. Martin Sansianco, Tanawan, Batangas.
O1530. Overland	Simeon Ramos, McKinley, Vigan, Ilocos Sur.
O1531. Paige	Simon M. Santiago, 1 Pedro, S. Miguel, Bulacan.
O1532. Partin Palmer	Frank H. Gaulette, 537 Peñafrancia.
O1533. Hupmobile	A. D. Gibbs, Pasay Beach, Rizal.
O1534. Brasier	Alfredo Versiza, Lipa, Batangas.
O1535. Hupmobile	Do.
O1536. Brush	Joseph Johnston, Zamboanga, Zamboanga.
O1537. Hupmobile	L. P. Willis, Dumaguete, Oriental Negros.
O1538. Buick	Angel Jose, 159 Buenavista.
O1539. Ford	Do.
O1540. Overland	Carmen Muños, 9 Aviles.
O1541. Little	Severo Escoto, Maycawayan, Bulacan.
O1542. Marion	Felipe Rubi, Sambag, Cebu.
O1543. Dodge	Rev. Anastacio del Corro, Carcar, Cebu.
O1544. White	Do.
O1545. Ford	Joaquin A. Bona, Candon, Ilocos Sur.
O1546. Dodge	Juan Royo, Sambag, Cebu.
O1547. Overland	George A. Yared, Cebu, Cebu.
O1548. ....do	Yap Chin Siong, Cebu, Cebu.
O1549. ....do	Filomeno Silva, Cebu, Cebu.
O1550. ....do	Rosalio Reyes, Sambag, Cebu.
O1551. Hudson	W. Reichenbach, S. Miguel Brewery, Manila.
O1552. Overland	Pablo Hermosa, Talisay, Cebu.
O1553. ....do	Rev. Pablo Hermosa, Talisay, Cebu.
O1554. Buick	Crispino de la Merced, Baliwag, Bulacan.
O1555. Studebaker	Vicente Madrigal, 247 Alhambra.
O1556. Maxwell	T. G. Henderson, Camp Stotsenburg, Pampanga.
O1557. Chevrelet	Francisco Grey, 658 Sta. Mesa.
O1558. Studebaker	Mariano Legaspi Florendo, 105 Aviles.
O1559. Hupmobile	L. E. Halden, 408 A. Uli-Uli, Aviles, Manila.
O1560. Ford	W. A. Hoppell, 15 Pasage del Carmen.
O1561. ....do	Leandro Vivo, Rosario, Cavite.
O1562. E. M. F	Hammon, H. Buck 1154 M. H. del Pilar.
O1563. Overland	Juan Estella, 418 T. Alonso.
O1564. Hupmobile	R. O. Warrington, 231 Buenavista.
O1565. ....do	Do.
O1566. Siddeley	Ramon Pettierra, S. Pedro Macati, Rizal.
O1567. Hupmobile	Chua Guioc, 561 Juan Luna.
O1568. King	Mrs. Cristina Gonzalez Schenkel, 171 Gastambide.
O1569. Brasier	Gregorio Sy Quia, 18 Colon, Vigan, Ilocos Sur.
O1570. Paige	Do.
O1571. Mitchel	Do.
O1572. Overland	Brimo Hizon, 2209 Azcarraga.
O1573. Ford	Ricardo Marcilino, 477 Juan Luna.
O1574. Hupmobile	Antonio Porta, 122 Arzobispo.
O1575. Buick	L. J. Francisco, 1282 M. H. del Pilar.
O1576. Renault	Dr. Ramon Papa, 710 Evangelista.
O1577. Ford	C. G. Lothigus, U. S. A. Service, Manila.
O1578. Briscoe	Jose Moreno Lacalle, 16 Escolta.
O1579. Overland	Barcelisa Vda. de Gorricho, 874 Sta. Mesa.
O1580. Buick	T. Anthols, 230 Uli-Uli.
O1581. Maxwell	Pedro A. Narciso, 651 Regidor.
O1582. ....do	Henry W. Peabody Co., Buenavista, Manila.
O1583. Hudson	Laureano Mañalac, 405 El Dorado.
O1584. Saxon	R. M. Hendrickson, Baguio, Benguet.
O1585. Dodge	Vicente P. Singson, Vigan, Ilocos Sur.
O1586. Brasier	Eulalio Lacson, Talisay, Occidental Negros.
O1587. C. Bayard	Maria Lopez Vda. de Guerero, 121 Alhambra.
O1588. Ford	Angel Encarnación, Vigan, Ilocos Sur.
O1589. Hupmobile	Bartolome Lacson, Talisay, Occidental Negros.
O1590. Overland	Jose Villanueva, Vigan, Ilocos Sur.
O1591. Saxon	Ramon Gamboa, S. Carlos, Occidental Negros.
O1592. Ford	Jose Villanueva, Bâtangas, Batangas.
O1593. Hudson	Gregorio Agoncillo, Taal, Batangas.
O1594. Hupmobile	Zacarias Villamiel, Atimonan, Tayabas.
O1595. Chalmers	Vedasto N. Cadeliña, Lucban, Tayabas.
O1596. Delehaye	Mrs. A. Weill, Iloilo, Iloilo.
O1597. Hupmobile	Manuel Peremne, Iloilo, Iloio.
O1598. E. M. F	Socorro Reyes, Vigan, Ilocos Sur.
O1599. Hupmobile	Antonio M. Jimenez, Vigan, Ilocos Sur.
O1600. Dodge	I. H. Kleinworth, Pasay Beach, Rizal.
O1601. Peugeot	Go Piat, 542 Echague.
O1602. Cadillac	Do.
O1603. Overland	F. C. Roberson, Ft. Wm. McKinley, Rizal.
O1604. Dodge	Benito Legarda, 964 R. Hidalgo.
O1605. Dodge	Marcos Roces, 127 Aviles.
O1606. Ford	John V. Green, Pettit Barracks, Zamboanga.
O1607. Dodge	Rev. Jose Clos, S. J., Zamboanga, Zamboanga.
O1608. Trumbull	Rafael Monzerrat, Lingayen, Pangasinan.
O1609. Ford	E. G. Turner, Lingayen, Pangasinan.
O1610. Overland	Feliciano Basa, 512 Lara.
O1611. Reo	Lucilo Fernandez Lavadia, Pagsanjan, Laguna.
O1612. Cadillac	Jose T. Reyes, Malolos, Bulacan.
O1613. Ford	Angel Roco, 2141 Herran.
O1614. Dodge	Catalino Cruz, Batangas, Batangas.
O1615. Ford	B. L. Burch Major of Calo, Camp Stotsenburg, Pampanga.
O1616. Hupmobile	Enrique Altavas, 1314 California.
O1617. Ford	Juan Brieve Seaside, Pasay, Rizal.
O1618. Overland	Francisco Lim, 2285 Herran.
O1619. Buick	Catalino Robles, Manapla, Occidental Negros.
O1620. Metz	Esteban de la Rama, Talisay, Occidental Negros.
O1621. Maxwell	Vicente Yulo, Bago, Occidental Negros.
O1622. Ford	Wm. T. Hilles, Pasay Beach, Rizal.
O1623. Brasier	Jose E. Alamany, 59 P. del Carmen.
O1624. Cadillac	M. L. Sawyer, 400 Inverness..
O1625. Ford	W. O. Crosbey, 10 Military Plaza.
O1626. Saxon	Santiago de Urquijo, Iloilo, Iloilo.,
O1627. Renault	Miguel J. Osorio, 39 Gral. Solano.
O1628. Dodge	R. J. de Pradera, Iloilo, Iloilo.
O1629. Overland	Rev. Pedro Silvestre, Sariaga, Iloilo.
O1630. Mitchel	Paul Meller, 800 Wright.
O1631. Buick	James Mitchel, Muelle de la Industria
O1632. Hupmobile	Antonio Tinsay, Iloilo, Iloilo.
O1633. Ford	Antonio Aymami, Iloilo, Iloilo.
O1634. R. C. H	Eusebio Lopez, Iloilo, Iloilo.
O1635. Studebaker	Crispulo Sideco, S. Isidro, Nueva Ecija.
O1636. Ford	Luzon Brokerage & Co., Manila.
O1637. A. Detroit	Harold M. Pitt, 1210 California.
O1638. Dodge	Eugenio Lopez, Iloilo, Iloilo.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O1639. Hupmobile	Dr. W. J. Burke, 48 Aviles
O1640. Dodge	Do.
O1641. Studebaker	Federico Montinola, Bago, Occidental Negros.
O1642. Renault	Macario Rufino, 53 Domingo, Pasay, Rizal.
O1643. Ford	Go. Po, 806 Echague.
O1644. Chalmers	J. Bialogleuski, Manila.
O1645. Buick	Glicerio Versoza, Batac, Ilocos Norte.
O1646. Hudson	Anastacio Medel, 823 Magdalena.
O1647. Dodge	Dr. Jose Eduque, 1347 Herran.
O1648. Hupmobile	Do.
O1649. Overland	Walter Bull, Cebu, Cebu.
O1650. Buick	Fred A. Leas, Pasay Beach, Rizal.
O1651. Renault	Juan Nolasco, 9 Quesada.
O1652. Little	Sandalio Oquiñena, Cebu, Cebu.
O1653. Hupmobile	Rev. Francisco Latorre, Sibonga, Cebu.
O1654. Ford	Hawaiian Sugar Planters Association Cebu, Cebu.
O1655. Maxwell	Dolores del Rosario, 243 Espeleta.
O1656. Ford	V. L. Tipten, Baguio, Benguet.
O1657. Overland	Eulalio Garcia, Lucena, Tayabas.
O1658. Studebaker	Roberto C. Chuidian, Balayan, Batangas.
O1659. Hupmobile	Dr. Mariano Yulo, Bacolod, Occidental Negros.
O1660. Ford	J. Norris Bogle, 214 Buenavista.
O1661. Hupmobile	Vicente Tecson, S. Miguel, Bulacan.
O1662. Studebaker	George R. Harvey, 644 Herran.
O1663. Ford	Manuela A. Locsin, Occidental Negros.
O1664. White	Philippine National Bank, Iloilo, Iloilo.
O1665. Overland	G. I. Cullen, 16 Gral. Blanco, Iloilo.
O1666. Oakland	Jose Alejandrino, Arayat, Pampanga.
O1667. Hudson	Tirzo Lizarraga, Iloilo, Iloilo.
O1668. Buick	F. L. Lawrence, W. F. Stevenson & Co., Manila.
O1669. Hupmobile	Nicolas A. Lizares, Talisay, Occidental Negros.
O1670. S. Booth	Serafin P. Hilado, Bacolod, Occidental Negros.
O1671. Reo	C. S. Gould, Capt. Q. M. Corps, Camp McGrath, Batangas.
O1672. Hupmobile	George B. Asp, 1275 M. H. del Pilar, Manila.
O1673. do	Salvador de la Rama, Talisay, Occidental Negros.
O1674. Ford	Bernabela de la Rama, Silay, Occidental Negros.
O1675. Hupmobile	Feliciano Quiogue, 247 Soler, Manila.
O1676. Studebaker	Do.
O1677. Dodge	Elwood S. Brown, 2859 Herran, Manila.
O1678. Overland	Feliciano Quiogue, 247 Soler, Manila.
O1679. Dodge	Roque Hofileña, Bacolod, Occidental Negros.
O1680. Trumbull	Gregorio Manuel Loring, Iloilo, Iloilo.
O1681. Dodge	Walter M. Saul, Iloilo, Iloilo
O1682. Hupmobile	Gregorio Manuel Loring, Iloilo, Iloilo.
O1683. Saxon	J. C. Hoskyn, Iloilo, Iloilo.
O1684. Hupmobile	Mariano Buenaflor, Pontevedra, Occidental Negros.
O1685. Maxwell	Miss Emilia Moreno, Daet, Ambos Camarines.
O1686. Pullman	Francisco B. Sochayseng, 914 A. Rivera, Manila.
O1687. Dodge	Isidoro Lim, 421 Ilang-ilang.
O1688. do	Mariano Herrera, Sariaya, Tayabas.
O1689. California	Capt. M. E. Morris, Camp Keithley, Lanao.
O1690. Dodge	Juan Vales, Cebu, Cebu.
O1692. Overland	Felix Montinola Celis, Saravia, Occidental Negros.
O1693. Ford	Frank W. Stipp, Laoag, Ilocos Norte.
O1694. Dodge	Fura de Luna, Tuguegarao, Cagayan.
O1695. Brasier	Andres Los Baños, Legaspi, Albay.
O1636. Ford	Irving J. Davis, Manila.
O1697. do	James A. Ostrand, 259 Real, Pasay, Rizal.
O1698. do	J. W. Sidford, Darhams Building.
O1699. Buick	Maximino Jalandoni, Jaro, Iloilo.
O1700. do	El Hogar Filipino, Muelle de la Industria.
O1701. Dodge	Olimpio Guanzon, Sta. Rita, Pampanga.
O1702. Studebaker	Edwin H. Rackley, Stotsenburg, Pampanga.
O1703. Ford	W. A. Muir, Iloilo, Iloilo.
O1704. Dodge	Ernesto Jalandoni, Iloilo, Iloilo.
O1705. Overland	Modesto Ledesma, Iloilo, Iloilo.
O1706. Hupmobile	Ramon Sosteguer, Sta. Barbara, Iloilo.
O1708. do	Manuel Consing Iloilo, Iloilo.
O1709. Buick	Alejandro Mirasol, Iloilo, Iloio.
O1710. do	Julio Javellana, Iloilo, Iloilo.
O1711. Hudson	Antonio Melian, 4 Nebraska, Manila.
O1712. Cadillac	Do.
O1713. Saxon	Raymundo Melliza, Molo, Iloilo.
O1714. Maxwell	Do.
O1715. Hupmobile	Vicente Javellana, Jaro, Iloilo.
O1716. Overland	G. E. Brewster, 524 San Marcelino. Manila.
O1717. Studebaker	Charles J. Williams, 30 Legarda, Manila.
O1718. Franklin	Mrs. Adela C. Baldwin, Muntinlupa, Laguna.
O1719. Dodge	Vicente Javellana, Jaro, Iloilo.
O1720. Minerva	Alfredo Hidalgo, Rizal, 826 Magdalena.
O1721. Inter-State	Henry Alkan, 100 Escolta.
O1722. Buick	Alfredo Roench, 903 Taft Ave.
O1723. Ford	Macario Carrillo, 105 Loreto.
O1724. Hupmobile	Concepcion Lopez, 112 Arquiza, Manila.
O1725. Enger	Dr. Benito Valdez, 964 R. Hidalgo, Manila.
O1726. Hupmobile	Alfredo Verzoza, Lipa, Batangas.
O1727. Dodge	Jose Fernandez Oytana, 1877 Juan Luna, Manila.
O1728. Buick	William Hough, Manila F. M. D.
O1729. Dodge	William Mayger, Jr. 158 Juan Luna, Manila
O1730. Hupmobile	Cirila Arcinas, S. Juan del Monte, Rizal.
O1731. Reo	Marcel Blum, 250 David, Manila.
O1732. Hupmobile	A. Quijano, 877 Dart.
O1733. Berliet	William Kennedy, 453 Looban.
O1734. Studebaker	Emilio Veloso, Parañaque, Rizal.
O1735. do	N. E. Thompson, San Marcelino, Manila.
O1736. do	Domingo Ordoveza, Sta. Cruz, Laguna.
O1738. King	L. Caballero, 272 San Marcelino, Manila.
O1739. Dodge	Gabino M. Veloso, Cebu, Cebu.
O1740. Oakland	Aurea Tanchiong, 268 Moriones, Manila.
O1741. Hupmobile	James R. Leask, 158 Juan Luna, Manila.
O1742. Waverly	Dr. Joaquin Quintos, 1175 M. H. del Pilar.
O1743. Ford	C. E. Nathorst, 1004 Wright, Manila.
O1745. Buick	Pedro Flores, Sta. Cruz, Laguna.
O1747. Maxwell	Carlos Perez Rubio, 970 M. H. del Pilar.
O1748. Dodge	Robert K. Evans, 1 Military Plaza, Manila.
O1749. Maxwell	Jacinto B. Vito, 64 Dolores, Pasay, Rizal.
O1750. Chalmers	Maximiano Rosario, 448 Estero de Binondo.
O1751. Ford	Judge S. del Rosario, 106 Gastambide, Manila.
O1752. Dodge	Do.
O1753. Maxwell	A. Aguado, 428 Moriones, Manila.
O1754. Dodge	Emilio Garcia, Iloilo, Iloilo.
O1755. Hupmobile	Jose P. Tinsay, Molo, Iloilo.
O1756. Studebaker	Ruperto Montinola, Iloilo, Iloilo.
O1757. Chalmers	Juan Coronado, 2560 Lico, Manila.
O1758. Dodge	Jose H. Jalandoni, Jaro, Iloilo.
O1759. Hupmobile	Nemesio Bartolome, San Miguel, Bulacan.
O1760. Buick	Maximino Jalandoni, Jaro, Iloilo.
O1761. Hupmobile	F. W. Dudley, 14-16 Pinpin, Manila.
O1762. do	Filomeno Diaz, 209 Elizondo, Manila.
O1763. Dodge	Dr. Samuel K. Carson, Iloilo, Iloilo.
O1764. Ford	Enrique Sunyer, 9 San Rafael, Iloilo.
O1765. S. Booth	Dr. Daniel Evangelista, Iloilo, Iloilo.
O1766. Hudson	Lim Eong, Iloilo, Iloilo.
O1767. Dodge	Antonio Villareal, Iloilo, Iloilo.
O1768. do	Vicente Sotto, Hotel de France, Manila.
O1769. Hupmobile	Carlos Borja, 662 Salcedo, Manila.
O1770. Brasier	M. I. O'Doherty, Archibishop's Palace, Manila.
O1771. Cadillac	Do.
O1772. Partin-Palmer	C. H. Hawkins, Iloilo, Iloilo.
O1773. Jeffery	Filomena Araneta, Molo, Iloilo.
O1774. Buick	Julio Javellana, Iloilo, Iloilo.
O1775. Dodge	Matilde Jalandoni, Jaro, Iloilo.
O1776. Oakland	Alfred Berwin, 30 Gral. Luna, Iloilo.
O1777. Dodge	Maria Berceñas, Iloilo, Iloilo.
O1778. do	Eusebio Lopez, Iloilo, Iloilo.
O1779. do	Albino Lopez, Iloilo, Iloilo.
O1780. Saxon	Martin Olsen, Iloilo, Iloilo.
O1781. Buick	Donato Pison, Molo, Iloilo.
O1782. Hudson	F. M. Yap Tico, Iloilo, Iloilo.
O1783. Studebaker	Capt. Frank O. Smith, Pettit Barracks, Zamboanga.
O1784. Maxwell	Rev. P. Eleuterio Pilapil, Malabuyoc, Bohol.
O1785. Ford	Felix Feria, 414 Isaac Peral, Manila.
O1786. Dodge	Manuel Novo, 25 Martinez, Cebu.
O1787. Buick	Catalino B. Chan, Mambajao, Misamis.
O1788. Ford	Ty Juan Chay, 116 Hormiga, Manila.
O1789. Dodge	Ruperto Sarmiento, Dalaguete, Cebu.
O1790. Ford	Visayan Refining Co., Cebu, Cebu.
O1791. Hupmobile	Luis Rotea, Tanjay, Oriental Negros.
O1792. do	Ramon Reynado, Bautista, Pangasinan.
O1793. Overland	Hijos de I. de la Rama, 28 Progreso, Iloilo.
O1794. Dodge	Do.
O1795. Hupmobile	Miguel Sanchez, Cebu, Cebu.
O1796. Ford	M. J. O'Doherty, Pilar Hospital, Zamboanga.
O1797. Pathfinder	F. E. Zuellig, 90 Rosario, Manila.
O1798. Pullman	Dr. Jose Jimenez, Mangaldan, Pangasinan.
O1799. R. C. H	W. H. Beedle, Dagupan, Pangasinan.
O1800. Hudson	M. Teague, 436 San Vicente, Manila.
O1801. Metz	W. H. Beedle, Dagupan, Pangasinan.
O1802. Hupmobile	Francisco F. Gonzales, Rosales, Pangasinan.
O1803. Dodge	Eleuteria Ch. Veloso, Sambag, Cebu.
O1804. Overland	Marcelo Beltran, Malasiqui, Pangasinan.
O1805. Ford	Ohta Development Co., Talomo, Davao.
O1806. Overland	Henry Fleicher, Dumaguete, Oriental Negros.
O1807. W. Knight	Do.
O1808. Overland	Juana Jacinto, 707 Elcano, Manila.
O1809. Reo	Paz Borja, 662 Salcedo, Manila.
O1810. Herreshoff	Serafin Martinez, 1038 Soler, Manila.
O1811. Ford	Robert L. Somuss, 664 Isaac Peral, Manila.
O1812. Dodge	Hijos de I. de la Rama, Talisay, Occidental Negros.
O1814. Overland	Tobias Wright, Luneta Hotel, Manila.
O1815. Maxwell	Ch. W. Polet, 20 hipodromo, Sta. Mesa, Manila.
O1816. Overland	Ysidro Mendoza, 782 San Andres, Manila.
O1817. Ford	J. Gelbreath, Malabon Sugar Co., Smith Bell, Rizal.
O1818. Buick	F. P. Paterno, 645 Ave. Rizal, Manila.
O1819. do	Narciso Alegre, 613 A. Mabini, Manila.
O1820. Studebaker	Luciano L. Bernabe, 708 Salcedo, Manila.
O1821. Dodge	Pampanga Sugar Co., Ltd., 747 Dart, Manila.
O1822. Stanley	T. J. S. B. Stevens, 8 Azucena, Sta. Ana, Manila.
O1823. Hupmobile	Mr. A. M. Reith, 408 Aviles, Manila.
O1824. Buick	A. C. Williams, Luneta Hotel, Manila.
O1825. Hupmobile	Roberto Moreno, 1825 Juan Luna, Manila.
O1826. Brasier	W. Meyer, 441 Nueva, Manila.
O1827. Ford	Vicente Cavana, 31 Perdigon, Manila.
O1828. Humber	Augusto Tuazon, 135 Aviles, Manila.
O1829. Imp	Clemente Hidalgo, 953 Magdalena, Manila.
O1830. Chevrolet	C. J. Heffting, Pasay, Rizal.
O1831. Trumbull	Maximino Noel, Carcar, Cebu.
O1832. Studebaker	Crecencio Bernardo Alonzo, Philippine Sugar Estate Calamba.
O1833. Delahaye	Baldomero de la Rama, Bacolod, Occidental Negros.
O1834. Ford	Dr. L. Lopez, 121 L. Guerrero, Manila.
O1835. Trumbull	Dr. Amador B. Inocencio, Iloilo, Iloilo.
O1836. Buick	Francisco Dinglasan, Capiz, Capiz.
O1837. Hupmobile	Cayetano Bastes, Loboc, Bohol.
O1838. Brush	Fortunato Acuña, Capiz, Capiz.
O1839. Overland	Nicolas D. Labayen, Alaminos, Pangasinan.
O1840. do	Vicente Panilio, San Fernando, Pampanga.
O1841. Buick	H. B. Ondreas, Malolos, Bulacan.
O1842. do	Estefania Ch. Veloso, Sambag, Cebu.
O1843. Overland	Dr. Miguel Cañizares, Malolos, Bulacan.
O1844. do	Chu. To Nam, Capiz, Capiz.
O1845. Ford	Jose F. Marfori, Cagayan, Misamis.
O1846. Hupmobile	Mauro Salvacion, Lucena, Tayabas.
O1847. Overland	V. E. Gonzales, Baguio, Benguet.
O1848. Reo	Vicente Hernaes, Talisay, Occidental Negros.
O1849. Overland	Francisco Goyena, Dagupan, Pangasinan.
O1850. Hudson	Josefa Jimenez de Garra, Sorsogon, Sorsogon.
O1851. Hupmobile	Gregorio Mañera, Tabaco, Albay.
O1852. Buick	Buenaventura E. Jao Oge, Legaspi, Albay.
O1853. Overland	Daniel T. Piamonte, 218 Moriones, Manila.
O1854. Ford	Agapito Buenconcejo, Tabaco, Albay.
O1855. Hupmobile	Institucion de Madres Agustinas, 260 S. Rafael.
O1856. Ford	Francisco Villanueva, 551 Legarda, Manila.
O1857. Hudson	C. S. Gilchrist, Cadiz, Occidental Negros.
O1858. Brasier	Nieves Fuentes, 619 T. Alonzo, Manila.
O1859. Palmer	Federic H. Stevens, 809 A. Mabini, Manila.
O1860. Buick	Fabian de la Paz, Jolo, Sulu.
O1861. Overland	Luciano de la Rosa, 572 Peñafrancia, Manila.
O1862. American	Ireneo Facundo, 513 San Fernando, Manila.
O1863. Renault	I. R. Infante, 34 Cortada, Manila.
O1864. Ford	Chas McDonough, Manila Hotel, Manila.
O1865. S. Booth	Do.
O1866. Maxwell	C. D. Behrens, 9 Alhambra.
O1867. Overland	Ciriaca Mariano, 538 Laguna, Manila.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O1868. Buick	Colegio de Niñas Tiples, Gral. Luna, Manila.
O1869. ......do	Capt. I. F. Costello, Ft. McKinley, Rizal.
O1870. Renault	Gregorio Singian, 450 Lamayan, Sta. Ana, Manila.
O1871. Panhard	Do.
O1872. S. Booth	Do.
O1873. Overland	Jose E. Marasigan, Batangas, Batangas.
O1874. Dodge	Vicente Diaz, Caibiran, Leyte.
O1883. Hupmobile	J. A. Wolfson, 224 Roxas, Manila.
O1884. Overland	Jose F. Lara, 405 Regidor, Manila.
O1885. Chalmers	Leonard S. Goddard, Legaspi, Albay.
O1886. Overland	Jose Herrera, Dumanjug, Cebu.
O1887. Ford	W. M. Crooks, Cebu, Cebu.
O1888. ......do	Carmen Maffei, 911 Isaac Peral, Manila.
O1889. Hudson	H. Carson Manhattan Hotel, Manila.
O1890. Overland	Wells Fargo & Co., 24 David, Manila.
O1891. Maxwell	Teodoro Palma Gil, Davao, Davao.
O1892. Overland	Felipe Dytoc, Legaspi, Albay.
O1893. Hupmobile	Carlos Stylianapulos, Legaspi, Albay.
O1894. Dodge	Mateo Goiti, Iloilo, Iloilo.
O1895. Hupmobile	Engracio Padilla, Iloilo, Iloilo.
O1896. Saxon	Marcelo Segovia, Molo, Iloilo.
O1897. Dodge	Rosa Garcia de Sala, La Paz, Iloilo.
O1898. Argyle	John Young, Iloilo, Iloilo.
O1900. Toaring	The Cablenews, Inc., 44 Mabini, Manila.
O1901. Dodge	Monico Salazar, 327 Barcelona, Manila.
O1902. Hudson	Jose Ma. de la Vina, Porta, S. Carlos, Occidental Negros.
O1903. Hupmobile	Basilio Borja, 719 Ave. Rizal, Manila.
O1904. Renault	Jose Almeda, 555 Nueva, Manila.
O1905. Overland	Francisco Infante, Valladolid, Occidental Negros.
O1906. C. Bayard	Jose Arnaiz, 218 San Luis, Manila.
O1907. Ford	Mrs. B. J. Johnson, Angeles, Pampanga.
O1908. Hupmobile	Bartolome P. Tioseco, Angeles, Pampanga.
O1909. Overland	Tan Cungco, Angeles, Pampanga.
O1910. Ford	Dr. Miguel Ochoa, 608 Almanza, Manila.
O1911. Delahaye	Jose Arnaiz, 218 San Luis, Manila.
O1912. Hupmobile	Antonio Soriano, Cabanatuan. Nueva Ecija.
O1913. ......do	Catalino Rodriguez, Sariaya, Tayabas.
O1914. Brasier	Teodoro de los Reyes, 2157 Azcarraga. Manila.
O1915. Hupmobile	Carlos Cuyugan, 103 San Rafael, Manila.
O1916. Dodge	Compania Mercantil de Filipinas. 189 Juan Luna.
O1917. Oakland	Tomas Sy Quia, 18 Colon, Viga, Ilocos Sur.
O1918. Hupmobile	H. B. McCoy, Pasay, Rizal.
O1919. Dodge	Lieut. Vicente Lim, 958 Magdalena, Manila.
O1920. Maxwell	Capt. J. H. Neff, Camp John Hay, Baguio.
O1921. Hupmobile	Dionisio Singson, Vigan, Ilocos Sur.
O1922. Overland	Venancio Meneses, Bambang, Bulacan.
O1923. H. Davidson	Pacific Commercial Co.. Manila.
O1924. Overland	G. A. Kauffman, 237 Alhambra.
O1925. Studebaker	Do.
O1926. H. Davidson	Pacific Commercial Co., Manila.
O1927. Apperson	Milton E. Springer, Army & Navy Club, Manila.
O1928. Chalmers	J. I. Thorne, Manila.
O1929. Buick	Atlantic Gulf & Pacific Co., Legaspi, Albay.
O1930. ......do	Victoria Valdez, 966 Folgueras, Manila.
O1931. ......do	Ramon Anson, Camalig, Albay.
O1932. Hupmobile	Candido Montilla, Pontevedra. Occidental Negros.
O1933. Studebaker	Paul Schilde, Behn Meyes & Co., Ltd., Manila.
O1934. Ford	Thos H. Cassidy, Albay, Albay.
O1935. Brasier	Leoncio Rodriguez, Sariaya, Tayabas.
O1936. Ford	Rosa Tiscar, San Jose, Antique.
O1937. Overland	Prudencio Papa, Legaspi, Albay.
O1938. ......do	Felix Montinola Lozada, Saravia, Occidental Negros.
O1939. Dodge	Jose Fuentes, Capiz, Capiz.
O1940. Smith	Serafin de la Riva, Virac. Albay.
O1941. R. C. H	Gaston O. Farrell, 589 Sales, Manila.
O1942. Buick	Raymundo D. Camacho, Dagupan, Pangasinan.
O1943. Brasier	Casamiro F. Perfecto, Iloilo, Iloilo.
O1944. Delahaye	Joaquin Casanovas, 929 M. H. del Pilar.
O1945. Oakland	Balbino Jancian, Daraga, Albay.
O1946. Buick	Francisco Jalandoni, Plaza Rizal, Jaro, Iloilo.
O1947. Dodge	P. Marquez Lim, Iloilo, Iloilo.
O1948. ......do	Ruperto Jalandoni, Jaro, Iloilo.
O1949. Metz	Antonio F. Oliveros, Pasig, Rizal.
O1950. Ford	Father J. Mansfeld, Arevalo, Iloilo.
O1951. Studebaker	Jose Yulo, 1 Rizal, Iloio.
O1952. Ford	Maurice P. Faley, Jaro, Iloilo.
O1953. ......do	Juan Carrero, 520 S. Luis, Manila.
O1954. Hupmobile	Leoncio Aréjola, Goa, Ambos Camarines.
O1955. Studebaker	Agaton Araneta, Iloilo, Iloilo.
O1956. ......do	Juan Tuason, 888 Santol, Manila.
O1957. Maxwell	Dr. Jose Tayag, Angeles, Pampanga.
O1958. Brasier	Proilan Lopez, Lucena, Tayabas.
O1959. Ford	Eladio de Guia, Bais, Oriental Negros.
O1960. Buick	W. C. Bunnel, Army and Navy Dept. Manila.
O1961. Dodge	Policarpo Soriano, Laoag, Ilocos Norte.
O1962. Reo	Cheng Gucco, Angeles, Pampanga.
O1963. Overland	Gabino Castro, Camp John Hay, Baguio.
O1964. Ford	Jose Ma. Basa, 341 Legarda, Manila.
O1965. W. Knight	Exchange Shoe Co., Amadeo, Manila.
O1966. Buick	Gabino Castro, Camp John Hay, Baguio.
O1967. Hupmobile	Florencio Chanco, Sariaya, Tayabas.
O1968. Overland	J. F. Bromfiels, Army & Navy Club, Manila.
O1969. Buick	Florencio Chanco, Sariaya, Tayabas.
O1970. Overland	Juan Santiago, Marilao, Bulacan.
O1971. R. C. H	Bartolome Agustin, Malolos, Bulacan.
O1972. Ford	Julian La O, 393 Paz, Manila.
O1973. Dodge	Policarpo Trinidad, Sariaya, Tayabas.
O1974. Paige	Dr. Quirino Teopaco, Sto. Niño, S. Fernando, Pampanga.
O1975. Buick	Dr. Proceso Lacsamana, Mexico, Pampanga.
O1976. Mercury	William H. Pickell Regan Barracks, Albay.
O1977. Hupmobile	Lorenzo T. Hocson, Pagsanjan, Laguna.
O1978. ......do	Arcadio Santos, Parañaque, Rizal.
O1979. Overland	Vicente de Vera, Sorsogon, Sorsogon.
O1981. Dodge	P. I. Antituberculosis Society, Pajardo Bldg. Manila.
O1982. Overland	Paul Newman, Naga, Ambos Camarines.
O1983. Ford	Alejandro Arce, Vigan, Ilocos Sur.
O1984. ......do	E. Ford Hickman, Vigan, Ilocos Sur.
O1985. Studebaker	Magdalena de Leon, Vigan, Ilocos Sur.
O1986. Dodge	Eugenio Veraguth, Pulupandan, Occidental Negros.
O1987. Ford	Miguel Romualdez, Zaragosa, Tacloban, Leyte.
O1988. ......do	Rev. F. Jamson, Batangas, Batangas.
O1989. Hupmobile	Vicente Tacderas Tarroja, Sto. Domingo, Ilocos Sur.
O1990. Ford	Charles E. Rath, Tacloban, Leyte.
O1991. Brasier	Felix M. Roxas, 177 Valenzuela, Manila.
O1992. Hupmobile	Joaquin Ledesma, Jaro, Iloilo.
O1993. Minerva	Rafael Gutierrez, New York, Paris, Manila.
O1994. Hupmobile	Aurelio Arevalo, 618 Salcedo, Manila.
O1995. Buick	Joaquin Ledesma, Jaro, Iloilo.
O1996. Ford	Albert Bryan, Iloilo, Iloilo.
O1997. Buick	Dee C. Chuan, 1028 Juan Luna.
O1998. Hupmobile	Jose Reguera, Iloilo, Iloilo.
O1999. Renault	Luis Mirasol, Iloilo, Iloilo.
O2000. Hupmobile	M. E. R. R. & L. Co., 134 Marcelino, Manila.
O2001. Dodge	Manuel R. Jacinto, Cabanatuan, Nueva Ecija.
O2002. Buick	J. E. Hernandez, Iloilo, Iloilo.
O2003. Buick	Alexander McCullough, Iloilo, Iloilo.
O2004. Hupmobile	Alejandra Ybañez Vda. de Johnson, 1001 Cordileria.
O2005. Studebaker	Tiburcio Saenz, Iloilo, Iloilo.
O2006. Dodge	Alberto Kappler, Iloilo, Iloilo.
O2007. Hudson	Presentacion Vda. de Lopez, Iloilo, Iloilo.
O2008. Hupmobile	Vicente Lopez, Iloilo, Iloilo.
O2009. Hudson	Luis Segovia, Molo, Iloilo.
O2010. Saxon	H. Waelti, 8 San Rafael, Iloilo.
O2011. Overland	Eugenio Rocha, Iliolo, Iloilo.
O2012. Dodge	Gregorio Jalbuena, Jaro, Iloilo.
O2013. Studebaker	G. I. Cullen, 16 Gral. Blanco, Ilolio.
O2014. Overland	Pedro G. Henares, Bacolod, Occidental Negros.
O2015. Hupmobile	Nels Peterson, Baguio, Benguet.
O2016. ......do	D. Ordoveza, Sta. Cruz, Laguna.
O2017. Cadillac	Rafael Lacson, Talisay, Occidental Negros.
O2018. Hupmobile	Carmelo Lizarraga, Iloilo, Iloilo.
O2019. Buick	E. J. Pelinder, Iloilo, Iloilo.
O2020. Dodge	Manuel Tiaoqui, 611 Ongpin, Manila.
O2021. Ford	J. W. Hodges, 12 A. Ladesma, Iloilo.
O2022. Oakland	Daniel Marquez, Lucena, Tayabas.
O2023. Hupmobile	Alfred Withworth Allen, Progreso, Iloilo.
O2024. ......do	Ceferino Jis de Ortega, Hinigaran, Occidental Negros.
O2025. Dodge	A. M. Recto, Lucena, Tayabas.
O2026. Everitt	Sisenando Palarca, Paniqui, Tarlac.
O2027. Saxon	Buntaro Yamada, Sta. Ana, Manila.
O2028. Overland	Esperidion Guanco, Hinigaran, Occidental Negros.
O2029. Brasier	Benedicto Nigdao, 175 Lipa, Manila.
O2031. Ford	Teodolfo M. Infante, Villadolid, Occidental Negros.
O2032. Brasier	Do.
O2033. Ford	E. C. Morton, 2d Lt. Q. M. Camp Stotsenburg, Pampanga.
O2034. Buick	Emilio Y. Hilado, Bacolod, Occidental Negros.
O2035. Hupmobile	Ramos, Ramos, Malolos, Bulacan.
O2036. Dodge	Leopoldo Sichon, Bacolod, Occidental Negros.
O2037. Ford	Asterio Favis, Bautista, Pangasinan.
O2038. Renault	Julio Ladesma, San Carlos, Occidental Negros.
O2039. Overland	Domingo Ciocon, Talisay, Occidental Negros.
O2040. Dodge	A. I. Robinson, Carlos, Iloilo.
O2041. Ford	Chas H. Naylor, Manila.
O2042. Buick	Francisco R. Santos, Silay, Occidental Negros.
O2043. Ford	Do.
O2044. ......do	Charles J. H. Naylor, 70 Anda, Manila.
O2045. Hupmobile	Angel Javellana, Siloy, Occidental Negros.
O2046. ......do	Felix Robles, Iloilo, Iloilo.
O2047. ......do	Placido Perez, Muelle de Banco Nacional, Manila.
O2048. Fladers	National Auto Repair Shop, 2205 Azcarraga.
O2049. American	Daniel Ledesma, Iloilo, Iloilo.
O2050. Ford	L. M. Nichols, 251 Arquiza, Manila.
O2051. Hudson	Canadian Pacific Railway Co., 18–20 Escolta.
O2052. Renault	Bernardino Jalandoni, Silay, Occidental Negros.
O2053. Studebaker	Emilio Gaston, Silay, Occidental Negros.
O2054. Hudson	Jose Gaston, Silay, Occidental Negros.
O2055. Hupmobile	Victor Gaston, Silay, Occidental Negros.
O2056. Ford	Maria P. de Lichauco, 103 Balmes, Manila.
O2057. Overland	Crisanto Lichauco, 103 Balmes, Manila.
O2058. Delahaye	Central Luzon Agricultural School, Muños, Nueva Ecija.
O2059. Hudson	Ignacio Lejarde, 11000 Ave. Rizal.
O2060. Ford	Diego de la Viña, Vallehermoso, Occidental Negros.
O2061. Hudson	Mariano Lim, 53 Plaza McKinley, Manila.
O2062. Hupmobile	Do.
O2063. ......do	Lorenzo Perez, 232 Lardizabal, Manila.
O2064. ......do	Joaquin Mendez, Iriga, Ambos Camarines.
O2065. Saxon	L. Escalderon, 134 Alejandro VI, Manila.
O2066. ......do	Jose Nepomuceno, 110 Plaza Goiti, Manila.
O2067. Buick	Vicente V. Gamboa, Silay, Occidental Negros.
O2068. Hupmobile	Abelardo Suarez, Silay, Occidental Negros.
O2069. Buick	Cipriano Perez, La Carlota, Occidental Negros.
O2070. Brasoer	Do.
O2071. Hudson	Petronilo del Rosario, 1701 Azcarraga.
O2072. ......do	Do.
O2073. Overland	Do.
O2074. Hupmobile	Jose Locsin Sian, Molo, Iloilo.
O2075. S. Booth	Daniel Ledesma, Iloilo, Iloilo.
O2076. Argyle	Wm. McMurray, Iloilo, Iloilo.
O2077. Dodge	Julian Ope, Guinobatan, Albay.
O2078. Hupmobile	Pedro Sabido, Peñaranda, Legaspi, Albay.
O2079. Dodge	Ruperto Mandieta, Manapla, Occidental Negros.
O2080. Buick	Narciso Gocioco, Angeles, Pampanga.
O2081. Overland	Dr. Jose Villacorta, Los Baños, Laguna.
O2082. Dodge	P. Juan Aballe, Ginatilan, Cebu.
O2083. Paige	Domingo Panlilio, Bacolor, Pampanga.
O2084. Overland	Jesus Garcia, 217 Cabildo, Manila.
O2085. Studebaker	Sabas Locsin, Hinigaran, Occidental Negros.
O2086. Hupmobile	Herminio Maravilla, Saravia, Occidental Negros.
O2087. Ford	Cesar Gamboa, Silay, Occidental Negros.
O2088. Jeffery	Antonio Menchaca, S. Carlos, Occidental Negros.
O2089. Brasier	Herminio Maravilla, Saravia, Occidental Negros.
O2090. Saxon	Felix Lacson, Silay, Occidental Negros.
O2091. Hupmobile	Marciano Araneta Yulo, Bago, Occidental Negros.
O2092. Overland	Juan Villamor, 27 A. Farnecio, Manila.
O2093. Hudson	Demetrio Aranguren y Jose Amestoy, La Carlota, Occidental Negros.
O2094. Overland	Juan Calleja, Malinao, Albay.
O2096. ......do	Maj. E. P. Nicholson, Camp Overton, Lanao.
O2097. Hudson	Pedro J. Hurth, Vigan Ilocos Sur.
O2098. King	T. W. Matsdairo, Camp Stotsenburg, Pampanga.
O2099. ......do	Do.
O2100. Hudson	Carlos Palanca, 540 T. Pinpin, Manila.
O2101. Mitchell	Jos D. Bronson, Camp Stotsenburg, Pampanga.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O2102. R. C. H	Manuel M. Cosio, San Fernando, La Union.
O2103. Hupmobile	Lope de la Rama, 22 Sta. Mesa, Manila.
O2104. Maxwell	Mariano Buyoon Lampa, Bacolor, Pampanga.
O2105. Renault	Enrica Vda. de Lizares, Talisay, Occidental Negros
O2106. Oakland	Juan D. Nepomuceno, Angeles, Pampanga.
O2107. Overland	Miguel Mendoza, San Ildefonzo, Bulacan.
O2108. Hupmobile	Rosendo Hernaez, Talisay, Occidental Negros.
O2109. Buick	Jacinto Valenzuela, Sta. Cruz, Laguna.
O2110. Hupmobile	Vicente Bigornia, Naguilian, La Union.
O2111. E. M. F	Nicetas Siguenza, Hinigaran, Occidental Negros.
O2112. Studebaker	Chan Bon Chong, 902 Lepanto, Manila.
O2115. Ford	Ford Garage & Repair Shop Cebu, Cebu.
O2118. Dodge	Arsenio Gamboa, Silay, Occidental Negros.
O2119. Hudson	Celso Ledesma, Saravia, Occidental Negros.
O2120. ......do	Antonio de Quesada, San Juan del Monte, Rizal.
O2121. Buick	Juan Comahort, 27 Arquiza, Manila.
O2122. Hupmobile	Andres Velez, San Nicolas, Cebu.
O2123. ......do	Cerniechiaro y Martorano, 154-156 Escolta, Manila.
O2124. Hudson	Galicano Limjuco, Lian, Batangas.
O2125. Minerva	Eduardo Gutierez Repido, 430 San Luis, Manila.
O2126. Briscoe	Do.
O2127. Hudson	Charles H. Brent, Bishop's House, Manila.
O2128. Dodge	Atlantic Gulf & Pacific Co., M. de la Industria, Manila.
O2129. Overland	Exequiel M. Santos, Cabanatuan, Nueva Ecija.
O2130. Dodge	Apolinario Baltazar, 533 Reyna Regente, Manila.
O2131. Buick	Willits & Paterson, Masonic Temple, Manila.
O2132. Hudson	Pedro Maravilla, Saravia, Occidental Negros.
O2133. Ford	Sotero Baluyot, Malolos, Bulacan.
O2134. ......do	Francisco J. Gonzales, 275 Peñafrancia, Manila.
O2135. Maxwell	Henry Musser, 167 Fraternidad, Manila.
O2136. Studebaker	Paul Kuppers, 249 San Anton, Manila.
O2137. Pullman	A. J. Gibson, 522 A. Mabini, Manila.
O2138. Hudson	Do.
O2139. Marion	Do.
O2140. Hupmodile	Mrs. Esteban Bassons, Manapla, Occidental Negros.
O2141. Maxwell	Doroteo A. Uyiangco, Pasay, Rizal.
O2142. ......do	M. Velasco & Co. 645 Soler, Manila.
O2143. Overland	Dalmacio Pakson, San Fernando, Pampanga.
O2144. Oakland	Felipe Jacinto, 954-962 Juan Luna, Manila.
O2145. Panhard	Perfecto Jacinto, 241 Morga, Manila.
O2146. Brush	Paglinawan, Hermanos, 120 Castaños, Manila.
O2147. Reo	Edward Nottebomhn, 1001 Valenzuela, Manila.
O2148. Ford	Dean C. Worcester, Opon, Cebu.
O2149. Hupmobile	Santiago Sy Juco, Malabon, Rizal.
O2150. Ford	Enrique de la Vega, 746 Union, Manila.
O2152. Studebaker	J. E. Delaney, 199 Manga Ave., Manila.
O2153. Ford	Co. Aceite de Manila, 614 Alvarado.
O2154. Studebaker	Edward Chesley, 1041 Vergara, Manila.
O2155. Hudson	R. M. McCrory, 1601 Pensylvania, Manila.
O2156. Buick	Judah H. Walsh, 633 A. Mabini, Manila.
O2157. Maxwell	Jose del R. Genqueco, 330 Malabon, Manila.
O2158. Hupmobile	Jose P. Tagle, 1004 Melchor Cano.
O2159. Buick	Nicolas Arceo Tan, 551 Elcano, Manila.
O2161. Chalmers	Joseph E. Fox, Luneta Hotel, Manila.
O2162. Overland	Go Tian, 525 Azcarraga, Manila.
O2163. ......do	Jose Morene Lacalle, 241 Zamora, Manila.
O2164. Buick	Capt. Crispulo Patajo, 418 T. Alonzo, Manila.
O2165. Overland	Placido Escudero, San Pablo, Laguna.
O2166. ......do	Rufino Tuanqui, Polangui, Albay.
O2167. Dodge	Dr. Jose Ma. Borromeo, Cebu, Cebu.
O2169. Brasier	John H. Sidebottom, Smith Bell & Co., Manila.
O2170. Buick	Juan Puruganan, Vigan, Ilocos Sur.
O2172. Ford	Mrs. Silina E. Waddington, 1234 A. Mabini, Manila.
O2173. Overland	Manuel T. Figueras, 374 Looban, Manila.
O2174. Saxon	S. M. Berger, 175 Juan Luna, Manila.
O2176. Brasier	M. Teaque, 436 San Vicente, Manila.
O2178. Ford	W. J. Stumpf, Baguio, Benguet.
O2179. Studebaker	Marciano Torres, Bago, Occidental Negros.
O2180. Maxwell	Jose Padilla, Quingua, Bulacan.
O2181. Buick	Julio Javellana, Iloilo, Iloilo.
O2182. Hupmobile	Benito O. Carranceja, Dagupan, Pangasinan.
O2183. Dodge	Sim Jangco, Rosales, Pangasinan.
O2184. Buick	Antonio Abad, San Leonardo, Nueva Ecija.
O2185. Overland	Carlos Florentino, Vigan, Ilocos Sur.
O2186. Dodge	Jose Pineda, Bacolor, Pampanga.
O2187. Ford	John T. Leavis, Twin Peaks, Tuba, Benguet.
O2188. Dodge	Carlos A. Imperial, 830 Benavidez, Manila.
O2190. Warren	Vicente Gonzales, 222 Raon, Manila.
O2192. Hupmobile	Enrique Echauz, Hinigaran, Occidental Negros.
O2193. Ford	W. O. Valentine, Bacolod, Occidental Negros.
O2196. Hupmobile	Cornelio Corteza, Talisay, Occidental Negros.
O2198. Dodge	Mariano Ramos, Bacolod, Occidental Negros.
O2202. ......do	Jose Castillo, Rosales, Pangasinan.
O2203. ......do	Manuel R. Revilla, 926 P. Faura, Manila.
O2204. Partin-Palmer	Jean M. Poizat, 823 Dart, Manila.
O2205. Pathfinder	J. B. Alegre, 65 Juan Luna, Manila.
O2208. Dodge	Macario Lim, 426 Asuncion, Manila.
O2209. ......do	Dr. Manuel Gomez, 622 Sales, Manila.
O2210. Overland	Francisco Alvarez, 172 Anda, Manila.
O2211. Dodge	Pablo A. Meyer, 887 Sta. Mesa, Manila.
O2212. Brasier	Casimiro Peña, Gral. Luis, Caloocan, Rizal.
O2213. Buick	Perfecto Hinlo, Manapla, Occidental Negros.
O2214. Overland	Auto Repair Shop, Manila.
O2215. Ford	C. B. Sturtevant, Bureau of Customs, Manila.
O2216. R. C. H	J. M. Bury, 234 Guerrero, Manila.
O2217. Buick	Ramon Ramos, 620 Mabini, Manila.
O2218. ......do	Teodroo R. Yangco, 101 Plaza del Conde, Manila.
O2219. ......do	Frank McDonald, 306 Misericordia, Manila.
O2220. ......do	Antonio Zuzuarregui, Lope de Vega, Manila.
O2221. Studebaker	Alfred F. Peters, Manila Club, Manila.
O2222. Roamer	Hon. Isauro Gabaldon, 193 Buenavista, Manila.
O2223. Renault	A. M. Barretto, Hotel de France, Manila.
O2224. Maxwell	Abdon Marchadesch, Burawen, Leyte.
O2225. Dodge	Catalino Valdesco, 894 Avenida Rizal, Manila.
O2226. Maxwell	Lambert Sales Co., 129 Juan Luna, Manila.
O2227. Briscoe	Agapito Zialcita, 429 Moriones, Manila.
O2228. Hudson	Lope P. Severino, Silay, Occidental Negros.
O2229. Paige	V. W. Houghton, Tabad Inn. Hotel, Manila.
O2230. C. Bayard	Pedro Alvarez, 172 Anda, Manila.
O2232. Overland	Natalio A. Cruz, Tarlac, Tarlac.
O2233. Chevrolet	Ruperto Sabinosa, 324 Caballeros, Manila.
O2234. Ford	Bernabe de Guzman, 434 Platerias, Manila.
O2235. Hupmobile	P. Emilio Veloso, Moalboal, Cebu.
O2236. Brasier	Luis Gomez, Bautista, Pangasinan.
O2237. Saxon	Leyte Land Transportation Co., Tacloban, Leyte.
O2238. King	Teodoro Donato, Vigan, Ilocos Sur.
O2239. Maxwell	Manuel Gonzales, Bautista, Pangasinan.
O2240. Ford	Dr. D. Vergel de Dios, Talavera, Nueva Ecija.
O2241. Hupmobile	Jose Gonzales, Azaola, 2241 Azcarraga, Manila.
O2242. W. Knight	Mrs. S. A. Presby, 44 A. Mabini, Manila.
O2244. Hudson	Tomas Flameño, 411 G. Tuazon, Manila.
O2245. Buick	Jose Abad Santos, 938 Herran, Manila.
O2247. R. C. H	Modesto Reyes, 19 Int. F. Blumentritt, S. Juan del Monte, Rizal.
O2248. Studebaker	Pedro Sorino, Bacoor, Cavite.
O2249. Saxon	Dr. Shamond Richmond, Albay, Albay.
O2250. Dodge	Jesus Valera Calderon, 880 M. H. del Pilar, Manila.
O2251. Maxwell	Agapito Ignacio, Navotas, Rizal.
O2252. Ford	Oleaga Hermanos y Corral, 1214 M. H. del Pilar.
O2253. Brasier	Modesto Reyes, 19 Int. F. Blumentritt, San Juan del Monte, Rizal.
O2254. Overland	Ramon S. Araneta, 1331 Herran, Manila.
O2255. Reo	M. Zamora, 512 Gomez, Manila.
O2258. Ford	J. N. Evangelista, Valingcaguin, Pangasinan.
O2261. ......do	R. G. Barnes, 1250 M. H. del Pilar, Manila.
O2262. Overland	Celso Ledesma, Saravia, Occidental Negros.
O2263. Hupmobile	Yubiao Sontua, Bautista, Pangasinan.
O2264. Dodge	Juan Singson, Cebu, Cebu.
O2265. Pullman	Emiliano Tria Tirona, 108 Moriones, Manila.
O2266. Reo	D. Denniston, 43 Aviles, Manila.
O2268. Dodge	Robert N. Wright, 212 Roxas Building, Manila.
O2269. Saxon	Mrs. Frederick C. Laing, 584 Peñafrancia, Manila.
O2270. Hudson	Leoncio Imperial, Albay, Albay.
O2271. ......do	Philippine National Bank, Manila.
O2272. Buick	Dr. Jose C. Locsin, Silay, Occidental Negros.
O2273. ......do	Vicente Quiogue, 917 Rizal, Ave.
O2274. Hudson	Do.
O2275. Oakland	Do.
O2276. W. Knight	Do.
O2277. Dodge	Nicolas del Rosario, Cabanatuan, Nueva Ecija.
O2278. ......do	Sra. Marcela La O, 522 Elcano, Manila.
O2279. ......do	Juan Garcia, Victoria, Tarlac.
O2280. W. Knight	Alberto Valette, 327 Carriedo, Manila.
O2282. S. Booth	Manuel N. Tuazon, 18 Gral. Luna, Manila.
O2283. Hupmobile	Guillermo Sison, Lingayen, Pangasinan.
O2285. Dodge	Antonio Solis, Lingayen, Pangasinan.
O2287. Hupmobile	Silvestre Orda, Atimonan, Tayabas.
O2288. Ford	Sixto S. Sandejas, 610 Looban, Manila.
O2290. Dodge	Mamerto Roxas, 624 Echague, Manila.
O2291. R. C. H	Emiliano Arellano, 515 Azcarraga, Manila.
O2292. Maxwell	Luis A. Cruz, Calamba, Laguna.
O2293. Dodge	Jose Javier, 548 Salcedo, Manila.
O2294. Buick	Prudencio Martir & Raymundo Calonge, 148 Anda.
O2296. Smith	Lawrence Benton, Zamboanga, Zamboanga.
O2297. Reo	E. M. Hawk, 120 Inverness.
O2299. Studebaker	Licarion Gomez, Calbayog, Samar.
O2300. Dodge	Juan Ismael & Co., Iloilo, Iloilo.
O2302. ......do	Julio F. Neri, Mambajao, Misamis.
O2305. ......do	Eduardo R. Tankiang, 508 Ongpin, Manila.
O2306. ......do	Capt. H. B. Parrott, P. S. 908 Georgia.
O2308. Oakland	Antonio Mestres, 18 El Guerrero.
O2311. Argo	Chan Quep, 450 Dasmariñas, Manila.
O2312. Brasier	L. R. Yangco, 6 Sociego, Manila.
O2313. Chandler	Do.
O2314. Dodge	Silvino de Guzman, Cabanatuan, Nueva Ecija.
O2315. Hudson	Mariano Gabriel, Navotas, Rizal.
O2316. ......do	Manuel T. Figueras, 374 Looban, Manila.
O2317. Overland	Roque Dato, Bohon, Samar.
O2319. Dodge	S. H. Eyier, 509 Dakota, Manila.
O2320. ......do	Telesforo Chuidian, Balayan, Batangas.
O2321. ......do	Jose L. de Leon, Bacolor, Pampanga
O2322. Berliet	Vicente Gochico, 322 Asuncion, Manila.
O2323. Panhard	Manuel Ortigas, 622 Ongpin, Manila.
O2324. Buick	Agustin Vergel de Dios, 1008 Benavidez, Manila.
O2325. Brasier	Ampil & Co., 514 Aviles, Manila.
O2326. Maxwell	Anacleto Filart, Dagupan, Pangasinan.
O2327. Dodge	Carlos Tirona, Kawit, Cavite.
O2328. ......do	Francisco A. Osorio, San Roque, Cavite.
O2329. ......do	Thos A. Wallace, 2021 Rizal Ave. Manila.
O2330. Argo	Timoteo Merlo, 2495 Herran, Manila.
O2333. Overland	Pascual Tinio, Talavera, Nueva Ecija.
O2334. Hudson	Antonio Brias, 624 Pensylvania, Manila.
O2336. ......do	Petra Perez y Isidro Perez, Pontevedra, Occidental Negros.
O2337. Buick	Hermenegildo Velmonte, La Carlota, Occidental Negros.
O2339. Overland	John Giloy, A 5 Balagtas, Manila.
O2342. Ford	Celso Dayrit, San Fernando, Pampanga.
O2343. Maxwell	Philippine Acetyline Co., Kneedler Bldg., Manila.
O2351. Buick	Celso Jover, Victorias, Occidental Negros.
O2354. Maxwell	E. A. Widner, Lutz & Co., Manila.
O2357. Buick	J. J. Newcombe, San Luis, Manila.
O2361. Studebaker	Matias Gonzales, Rosales, Pangasinan.
O2362. Saxon	Jose M. Sulueta, 1239 Misericordia, Manila.
O2366. Dodge	Juan Casanevas, 667 A. Mabini, Manila.
O2367. Ford	Trinidad Arcinas, 365 Gral. Luna, Manila.
O2369. Cadillac	Luis Versosa, Dingras, Ilocos Norte.
O2370. Hudson	Consuelo de Jesus, 615 Evangelista, Manila.
O2371. Chevrolet	Phil. Fiber & Produce Co., 16 P. Moraga, Manila.
O2373. Ford	Dr. A. M. Saleeby, 28 David, Manila.
O2380. Dodge	Henson & Orth, Masonic Bldg., Manila.
O2383. Argo-Jackson	Dr. R. Resureccion, Aringay, La Union.
O2385. Hudson	C. M. Cotterman, Pasay, Rizal.
O2387. Oakland	Catalino Ledesma, Ledesma St., Iloilo.
O2388. Buick	Mr. C. Wood, Manhatan Hotel, Manila.
O2394. Overland	Dr. Antonio Fernando, Cabanatuan, Nueva Ecija.
O2395. Hudson	Archibald Harrison, Malacañang Palace, Manila.
O2396. Ford	Oquiñena & Co., Cebu, Cebu.
O2397. Rambler	Robert Strikler, 106 Militar, Manila.
O2400. Dodge	Felipe Ismael, 18 David, Manila.
O2401. E. M. F	Felix Montenegro, Bais, Occidental Negros.
O2404. Dodge	Cecilia Montilla, Isabela, Occidental Negros.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O2406. Hupmobile	Juan Ramos, Sta. Cruz, Laguna.
O2408. Maxwell	Mamerto Suiza, Nagcarlang, Laguna.
O2413. do.	Alfredo Gruet, 940 Santol, Manila.
O2317. Touring	Mariano G. Veloso, Cebu, Cebu.
O2419. Dodge	R. Y. Rhea, Cavite, Cavite.
O2421. Maxwell	Mrs. Agmes C. Hartbuck, 64 Isaac Peral, Manila.
O2422. Studebaker	Mrs. Clara Vans Streader, 1533 Pensylvania, Manila.
O2424. Buick	Manila Electrict R. R. & L. Co., S. Marcelino.
O2425. Hupmobile	Bureau of Customs, Cebu, Cebu.
O2427. Buick	Hashim Commercial & Trading Co., 16 David, Manila.
O2428. do.	Bazar Velasco, 817 Dagupan, Pangasinan.
O2429. Dodge	Chas D. Ayton, 1 Brixton Hill, Manila.
O2431. Studebaker	Germiniano Arguelles, 643 Magdalena, Manila.
O2434. Hudson	Jose Lopez Villanueva, Bago, Occidental Negros.
O2438. Hupmobile	Eduardo Ferer, Bago, Occidental Negros.
O2439. Ford	Alejandro Roces, 19 Concepcion, Manila.
O2440. Dodge	Theobald Dielh, Army & Navy Club, Manila.
O2441. Brasier	Ambrosio Reyes, 703 Evangelista, Manila.
O2442. Hupmobile	Eleuterio Navoa, 911 Bilbao, Manila.
O2444. Dodge	Dr. Luis Gamboa, Silay, Occidental Negros.
O2445. Ford	Teofilo Sison, Lingayen, Pangasinan.
O2446. Marmon	Philippine Vegetable Oil Co., Manila.
O2448. Buick	Francisco Torres, S. Fernando, Pangasinan.
O2449. Ford	Luis Arnalot, 881 Magdalena, Manila.
O2451. Dodge	H. Labreton, 610 San Marcelino, Manila.
O2452. Ford	Dr. Jose Ma. Zullnech, Lucena, Tayabas.
O2454. Dode	Donato Teodoro, Calumpit, Bulacan.
O2457. Ford	E. C. McCullough & Co., Manila.
O2459. Dodge	Vicente Tiongson, Dagupan, Pangasinan.
O2460. Ford	W. S. Fickes, Cavite, Cavite.
O2465. Buick	Col. D. P. Quinlan, 127 Gral. Luna, Manila.
O2466. Ford	Richardson & Co., Ltd., Uy Chaco Bldg., Manila.
O2468. Dodge	S. de Mendoza, Manila.
O2472. Oakland	F. A. Bender, Camp Stotsenburg, Pampanga.
O2474. Buick	Manuel Tan Cuan, 729 Juan Luna, Manila.
O2475. Jeffery	Mariano Uy Chaco Sons, P. Cerventes, Manila.
O2476. Buick	Ricardo Delgado, Manapla, Occidental Negros.
O2478. Ford	R. Abriol, 613 Kansas Ave., Manila.
O2481. do.	E. C. McCullough & Co., Manila.
O2483. Overland	Jesus Medina, Zamboanga, Zamboanga.
O2484. Scripps Booth	Apolonia Bernatt, 141 Real, Manila.
O2486. Ford	Manuel J. Alberto, 672 Benavidez, Manila.
O2494. Overland	Fausto Ormochea, Tabaco, Albay.
O2496. Buick	Capt. Jose Perez, Brown U. S. Army, Manila.
O2497. Ford	H. E. Price, 24 Hipodromo, Manila.
O2498. do.	Capt. A. L. Estelle, Batangas, Batangas.
O2500. W. Knight	W. Z. Smith, 709 Pennsylvania Ave., Manila.
O2502. Maxwell	Gregorio Rojas, Manila.
O2508. Hupmobile	Ernesto Oppen, Palupandan, Occidental Negros.
O2509. Dodge	P. Julio Fernandez, Tubigon, Bohol.
O2511. Chandler	T. Reanchay, 116 Hormiga, Manila.
O2514. Hupmobile	Pedro R. Mateo, Baliuag, Bulacan.
O2517. do.	Society for the Prevention of Cruelty to Animals, 2212 Azcarraga, Manila.
O2521. Dodge	Pedro R. Melencio, Cabanatuan, Nueva Ecija.
O2524. Paige	Norton & Harrison Co., Knedler Bldg., Manila.
O2525. Studebaker	C. Nesbitt Duffy, 105 Manga Ave., Manila.
O2526. Buick	Carlos de Oteiza, 970 M. H. del Pilar, Manila.
O2528. do.	H. T. Fox, Smith Bell & Co., Manila.
O2533. Ford	P. B. Artesian Water Co., S. Juan del Monte, Rizal.
O2535. Mitchell	Teodora Reyes, 518 Rivera, Manila.
O2539. Overland	Exequiel Castillo, Batangas, Batangas.
O2542. Ford	W. F. Stevenson & Co., Ltd., Manila.
O2543. do.	L. M. Heras, 404 Principe, Manila.
O2552. Chandler	Yu Biao Sontua, 209 Dasmariñas, Manila.
O2553. Overland	The Robert Dollar Co., 406 Chaco Bldg., Manila.
O2556. Dodge	Benigno S. Aquino, Tarlac, Tarlac.
O2560. do.	Quintin Ong, 4766 Ave. Rizal, Manila.
O2562. Hudson	Dy Lac, 614 Almanza, Manila.
O2564. Ford	Eusebio Cabrera, Tarlac, Tarlac.
O2565. Hudson	Vicente Enriquez, Bulacan, Bulacan.
O2569. Ford	Dr. Francisco Xavier, Cagayan, Misamis.
O2573. Buick	Marcelo Pilapil, Liloan, Cebu.
O2574. Dodge	Juan L. Orbeta, Cebu, Cebu.
O2578. Ford	J. C. Hoffmeister, 149 Manga Ave., Manila.
O2579. S. Booth	Dr. Domingo Sangciagco, San Isidro, Nueva Ecija.
O2584. Dodge	Sixto Castillo, Tanauan, Batangas.
O2588. Ford	Inocencio Lim, 603 San Fernando, Manila.
O2590. Maxwell	Chesley Conde & Co., 105 Duque de Alba, Manila.
O2594. do.	Benito Sy Kong Bieng, 123 Juan Luna, Manila.
O2597. Paige	G. Andrews, 804 Wright, Manila.
O2598. Studebaker	E. G. Mapua, 422 Ronquillo, Manila.
O2600. S. Booth	S. Francisco Tecson, 162 Escolta, Manila.
O2601. Overland	Mrs. John R. Wilson, S. Juan del Monte, Rizal.
O2605. Studebaker	M. L. Stewart, 912 A. Mabini, Manila.
O2612. do.	Dr. G. Limkako, 302 Batangas, Manila.
O2614. Maxwell	The Insular Life Asurrance Co., Ltd., Manila.
O2615. Dodge	Vicente Fernandez, 154 Lamayan, Mnila.
O2620. Ford	S. Arlegui, 414 Del Pan, Manila.
O2622. Dodge	Dr. F. W. Vicent, 18 Pasage del Carmen, Manila.
O2623. Buick	Tomas Lorayes, Daraga, Albay.
O2624. Hudson	Uy Yet, 912 Benavidez, Manila.
O2626. Buick	Alejo Manabag, Lingayen, Pangasinan.
O2631. do.	Cosme Bragtan, Mangaldan, Pangasinan.
O2635. Ford	Col. R. N. Perley, Manila.
O2636. Maxwell	Basilio Salgado, 616 Teodora Alonzo, Manila.
O2638. do.	J. Talambiras, 265 San Rafael, Manila.
O2641. Ford	Arsenio Romero, Cabiao, Nueva Ecija.
O2645. Overland	David Roux, Lingayen, Pangasinan.
O2647. Saxon	Liborio Gomez, Albay, Albay.
O2643. Ford	C. Mallari, 418 Misericordia, Manila.
O2649. Dodge	Leopoldo Kanh, 613 Gonzales, Manila.
O2652. do.	Manuel de los Reyes, 89 Sta. Potenciana, Manila.
O2653. Buick	Uy Leong Guim, 148 Rosario, Manila.
O2655. Dodge	Jose Urquico, 706 Colorado, Manila.
O2657. Overland	Marcos Roces, 127 Aviles, Manila.
O2664. Dodge	Dr. Vicente Ocampo, Biñan, Laguna.
O2676. do.	Dr. Jose Lopez Villanueva, Silay, Occidental Negros.
O2677. do.	Juana Neri, Mambajao, Misamis.
O2678. do.	Teodoro Santos, San Fernando, Pampanga.
O2683. Oakland	Ricardo C. Barretto, 145 Gral. Luna, Manila.
O2685. Buick	John Falbot, Knowles, Sambag, Cebu.
O2686. Overland	Dr. Catalino B. Boncan, 720 Benavidez, Manila.
O2687. Ford	Dr. Angel B. Borromeo, 332 Alvarez, Manila.
O2688. Dodge	Julia Vda. de Lopez, 611 A. Mabini, Manila.
O2690. do.	Joaquin Angulo, Calamba, Laguna.
O2691. Ford	Atanacia Lim, San Miguel, Bulacan.
O2694. do.	Toyo Kisen Kaishass & Co., Chaco Bldg., Manila.
O2700. Lexington	Lieut. E. O. Nutchell, Cavite, Naval Station.
O2703. Ford	P. C. Libby, Davao, Davao.
O2706. do.	Dr. Marcos Lipana, 907 Clavel, Manila.
O2708. do.	Macleod & Co., Inc., Chaco Bldg., Manila.
O2710. Grant	Habib Salem, 1965 Juan Luna, Manila.
O2713. Ford	Lacson & Lacson, 123 Rosario, Manila.
O2714. Overland	Venancio Verar, Ligao, Albay.
O2715. Buick	Arcadio Solatorio, Napla, Occidental Negros.
O2719. Dodge	Enrique Lizares, Talisay, Occidental Negros.
O2720. do.	Norberto Clemente, 828 Bilbao, Manila.
O2722. Buick	Geo. Gaseltine, 413 Sto. Sepulcro.
O2726. Saxon	Isidro Vamenta, 253 M. H. del Pilar, Manila.
O2727. Briscoe	Go Pengco, 60 Rosario, Manila.
O2733. Ford	Nabuo Takada, 420 Rizal Ave., Manila.
O2748. Maxwell	M. Tagawa, 522 Alvarado, Manila.
O2750. S. Booth	Faustino Lichauco, jr., 243 Aviles, Manila.
O2752. Ford	Standard Oil Co., Iloilo, Iloilo.
O2753. do.	Do.
O2757. Buick	Yap & Co., Legaspi, Albay.
O2758. do.	Standard Oil Co., Cebu, Cebu.
O2750. do.	Do.
O2764. Oakland	Lichauco & Co., Inc., 117 Dasmariñas, Manila.
O2766. Ford	Florencio Legaspi, 420 Barcelona, Manila.
O2767. Buick	Luis Martinez, Sorsogon, Sorsogon.
O2768. do.	Leopoldo Verdote, Camalig, Albay.
O2772. Hupmobile	Ignacio Hervas, 551 M. H. del Pilar, Manila.
O2775. do.	Uy Tengpiao, 566 Reina Regente, Manila.
O2778. Maxwell	Elias Bonoan, 766 Sto. Cristo, Manila.
O2779. do.	S. C. Schwarzkoph, 411 Sto. Sepulcro.
O2782. Overland	Atlantic Gulf & Pacific Co., Manila.
O2784. Buick	Shiras M. Jones, 556 A. Mabini, Manila.
O2787. Hupmobile	Leopoldo Kanh, 613 Gonzales, Manila.
O2789. Smith	Marcelino Robles, Malolos, Bulacan.
O2794. Studebaker	Ennet Jones, 479 Peñafrancia, Manila.
O2795. Hudson	Fernando Zobel, 165 M. de Comillas, Manila.
O2800. Overland	W. W. Brown, 204 San Luis, Manila.
O2801. Hudson	Tomas Paras, San Fernnado, Pampanga.
O2814. Overland	Dr. J. W. Lewis, Canlubang, Laguna.
O1816. Buick	Magdaleno Fajardo, Dumalag, Capiz.
O2817. do.	Yutivo Sons Hardware Co., 3-9 P. Cervantes, Manila.
O2820. Rambler	Hashim Comm. Trading Co., Ltd., 18 David, Manila.
O2822. Buick	W. S. Macleod, 161 Buenavista, Manila.
O2826. Dodge	T. K. Okabe & T. Daiddoji, 436 Legarda, Manila.
O2828. Cadillac	E. C. Travis, Manila Hotel, Manila.
O2829. American	Valera é Hijos, 736 Benavidez, Manila.
O2831. Maxwell	Telesforo Hernando, 957 Ylaya, Manila.
O2832. S. Booth	Pilar Martinez, 210 Gral. Luna, Manila.
O2834. Oakland	Fernando Martinez, 210 Gral. Luna, Manila.
O2836. Dodge	F. E. Greenfield, Canlubang, Laguna.
O2838. do.	Agapito Francisco, 769 Magdalena, Manila.
O2841. do.	Miguel Velasco, 2 Uli-Ulo, Manila.
O2842. do.	La Insular Cigar Factory, Manila.
O2846. do.	Praxedes Sayo Vda. de Soriano, 225 Binondo.
O2847. do.	Asuncion Soriano, 716 Asuncion, Manila.
O2850. do.	Ignacio Carlos, 526 Almanza, Manila.
O2856. do.	Estefania Silvestre, 1063 Singalong, Manlia.
O2858. do.	Mrs. A. W. Beam, 565 Gral. Luna, Manila.
O2860. Chandler	Antonio M. Quintos, Binalona, Pangasinan.
O2861. Smith	Jose Somes, 530 Legarda, Manila.
O2864. Buick	Pacific Mail Steamship Co., Manila.
O2868. Cadillac	Chas D. Ayton, 1 Brixton Hill.
O2869. W. Knight	Samuel F. Gache, 700 Wright.
O2870. Oakland	Geronimo Couder, 179 Real, Manila.
O2872. Overland	Dionicio Nolasco, Camalig, Albay.
O2873. Saxon	Constancio F. Cepulveda, 57 Colon, Cebu.
O2874. Buick	Shiras M. Jones, 556 A. Mabini, Manila.
O2875. Lexington	Mrs. Luis Haymoun, 137 Pinpin, Manila.
O2876. Chevrolet	Ramon Mabanta, 1057 Rizal Ave., Manila.
O2877. Paige	Jose A. de Aramburo, Ligao, Albay.
O2881. Oakland	Fernando Espino, 932 Benavidez, Manila.
O2882. Hupmobile	Aniceto Cardenas, 754 Sto. Cristo, Manila.
O2889. Overland	Andres Eusebio, San Fernando, Pampanga.
O2891. Maxwell	J. J. Gochico, 539 Pinpin, Manila.
O2892. Dodge	Vicente Laureano, Bugasong, Antique.
O2894. W. Knight	F. J. Bishop, Pasay Beach, Rizal.
O2895. Chevrolet	Edward Linchnock, 7 Sociego, Manila.
O2898. Overland	Genaro Tan Torres, Malabon, Rizal.
O2900. W. Knight	Paul Meller, 800 Wright, Manila.
O2901. Mets	H. K. Pikerton, Albay, Albay.
O2903. Dodge	Leonardo Guison, 2093 Azcarraga, Manila.
O2908. Maxwell	Alberto Reyes, Vigan, Ilocos Sur.
O2909. do.	Dr. Jose Sison, Manaoag, Pangasinan.
O2911. Hupmobile	Aurelio Martinez, 43 Soler, Manila.
O2912. Studebaker	J. T. Pickett, 135 P. Sta. Cruz, Manila.
O2916. Roadster	Juan Marcelino, Cabanatuan, Nueva Ecija.
O2920. Indian	Jose de Leon, jr., San Miguel, Bulacan.
O2921. Dodge	San Miguel Brewery, 132 Aviles, Manila.
O2923. do.	Alejandro Generoso, 727 Zacateros, Manila.
O2930. W. Overland	Mrs. E. M. Bachrach, Malecon Drive, Manila.
O2938. Dodge	Generoso Reyes, 1004 Oroquieta, Manila.
O2939. do.	Col. Rafael Crame, 282 Marcelino, Manila.
O2943. Ford	Vicente de Gorotica, San Pablo, Laguna.
O2944. do.	Mrs. J. N. Wolfson, 224 Roxas Bldg., Manila,
O2948. Overlad	Luis Flores, 1084 R. Hidalgo, Manila.
O2950. W. Knight	Emilia Inductivo, 1115 Singalong, Manila.
O2953. Buick	Mrs. F. J. Herier, Pasay, Rizal.
O2954. Oakland	Filomena Cruz Vda. de Luna Angel Luna, Malabon, Rizal.
O2956. do.	Jose Luna, Malabon, Rizal.
O2961. Dodge	Capt. C. F. Wieland Q., 4 Manila Ordenance, Dept. Ft. Santiago.

Motor cars privately operated—Continued.

Registry No. and type.	Owner's name and address.
O2966. Overland	Rosendo Ralla, Ligao, Albay.
O2967. ....do	Florencio Castañeda, 197 G. Tuason, Manila.
O2968. Oakland	Don. D. Strong, 1359 Leveriza, Manila.
O2974. Paige	Harry E. Keeler, Cosmopolitan Bldg., Manila.
O2982. Overland	Francisco Querol, Ligao, Albay.
O2992. ....do	Manila E. R. R. L. Co., 134 Marcelino, Manila.
O2993. S. Booth	Amparo N. de Lichauco, 247 Aviles, Manila.
O2997. W. Knight	A. Sidler, 936 Raon, Manila.
O2998. Dodge	Zoilo C. Tambunting, 741 Benavidez, Manila.
O2999. ....do	Bonifacio Ysip, Cabiao, Nueva Ecija.
O3000. Country-Club	Lorenzo Calvo, B. P. W. Auto Dept., Manila.
O3002. Overland	Miss Leonisa Santos, 1214 H. Hizon, Manila.
O3008. W. Knight	Union Ins. Society of Canton, Ltd., 403–405 Uy Chaco Bldg.
O3010. Dodge	Dr. A. R. Ubaldo, 158 Gral. Luna, Manila.
O3011. ....do	Eduardo Kuaykong, Victorias, Occidental Negros.
O3012. W. Knight	Cenon Ayala, San Pedro Macati, Rizal.
O3014. Hudson	Pedro G. Gapas, La Carlota, Occidental Negros.
O3018. Overland	Dr. Julian Oyates, Guinobatan, Albay.
O3019. ....do	Dr. Joaquin Quintos, 1175 M. H. del Pilar, Manila.
O3020. Ford	Lacson & Lacson, Manila.
O3021. Roadster	Antonio Menchaca, San Carlos, Occidental Negros.
O3022. Dodge	Jose A. Paterno, 645 Ave. Rizal, Manila.
O3023. ....do	Juan M. Florendo, Vigan, Ilocos Sur.
O3027. Hupmobile	Salvador Rivero, Vigan, Ilocos Sur.
O3028. Overland	Leoncio Fernando, San Isidro, Nueva Ecija.
O3030. Dodge	Angeles, M. de Ramirez, 1120 Mabini, Manila.
O3032. Hudson	Celestino Mendiata, San Carlos, Occidental Negros.
O3040. Buick	Lacson & Lacson, Manila.
O3041. White	Philippine Vegetable Oil Co., Inc., Manila.
O3042. American	Do.
O3043. Hudson	Do.
O3044. Overland	Do.
O3045. American	Do.
O3046. ....do	Do.
O3047. Studebaker	Do.
O3048. ....do	Do.
O3049. ....do	Do.
O3050. Ford	Do.
O3051. Buick	Do.
O3052. Chalmers	Do.
O3053. Hudson	Do.
O3054. Chevrolet	Do.
O3055. ....do	Do.
O3056. ....do	Do.
O3057. ....do	Do.
O3058. Overland	Do.
O3059. Cadillac	Otto Vorster, c/o Philippine Vegetable Oil Co., Inc., Manila.
O3060. Norwalk	Do.
O3061. Hudson	Phil. Vegetable Oil Co., Inc., Manila.
O3062. White	Phil. C. Whitaker, Puerza, Manila.
O3090. Buick	Arsenio Locsin, 674 Evangelista, Manila.
O3100. Hudson	Guillermo B. Guevara, 424 Soler, Manila.
O3120. ....do	Baldomero Roxas, 417 Soler, Manila.
O3131. Roadster	Jack Levy, Manila.
O3199. Buick	Jose M. Dizon, Mabalacat, Pampanga.
O3200. Maxwell	Ramon F. Alberto, 924 Santol, Manila.

APPENDIX C.

PROJECTS ACTIVE JULY 1, 1918.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	3	3																		1							1				2		1	11
Agusan	4	3	1																						1	1					1		2	13
Albay	5	5																		1		1		2		1							1	16
Ambos Camarines	4	8		1	1					1			2							8	1			1	1								1	29
Antique	5	2								1										1				2				1					1	13
Bataan	3	4			1		1				1									1				1							2		1	15
Batangas	5	4	1		1					1		1							1	4	1		1	3	2			4				1	13	43
Benguet	11	8											2							1				1	4	6		2	2			1	10	48
Bohol	4	3		3	6															7					1			4					3	31
Bukidnon	2	1							1											2											1			7
Bulacan	4	3			2															1					1								2	13
Cagayan	5	2			1				1	1			1							1	2	2			1		1	2					6	26
Capiz	9	2			10			1												2							1						1	26
Cavite	3	2																		2				2		1							2	12
Cebu	8	2		1	1								1							1				5									4	23
Cotabato	9	4			2															4				1	1	2	1	1			2		7	34
Davao	8	3			1												1								3	1					2		8	27
Ilocos Norte	4	2							1											2			1											10
Ilocos Sur	8	4														1		1		4		1				1	1						3	24
Iloilo	10	4	3	3	2																			1	1			1			1		3	29
Isabela	4	2							1				2							7													3	19
La Laguna	8	2						1												10				2		2		1						26
Lanao	4	3		2																3													5	17
La Union	4	4																		7				1	1	1							3	21
Leyte	3	2			2				1		1		3							3		1		2	1						1		4	24
Mindoro	3	3		1						1										3	1				1			4					2	19
Misamis	4	3		1	1				1											1		1				1								13
Mountain Province	13	10			2					5			6						1	2	1	1		1			3					1	9	55
Nueva Ecija	7	2											1							3				1	1		1						12	28
Nueva Vizcaya	2	4		1																4		2											1	14
Occidental Negros	10	2		1	3			1					1											1			1						2	22
Oriental Negros	5	6								1	1		2							2								2			1		1	21
Pampanga	5	10			2			1					1							6				1			1							27
Pangasinan	12	3		1	2				1				2							1		1	1				1						2	27
Rizal	9	6		2	3												1			2						1								24
Samar	8	2																		2				1			1							14
Sorsogon	9	3						1									1			4				2	1			1						22
Sulu	3	3		2	2					1										5				1		4		1			1		4	27
Surigao	2	2																								1							1	6
Tarlac	9	3			2								1			1				1														17
Tayabas	11	3			1				1		1									2				1	2	2							2	26
Zambales	1	3			1					1																							2	8
Zamboanga	5	4		1	1					1										1					3						1		4	21
Total	255	154	5	20	50		1	5	8	14	4	1	25			2	3	1	2	112	6	10	3	33	26	25	13	24	2		15	3	126	948

NOTE.—Of the 126 projects under the caption "Miscellaneous," there are 8 surveys and investigations of roads, bridges, and hydrographies, etc.; 11 wharves, 3 irrigation systems, 10 hospital buildings, 2 boundary monuments, 1 dredging project, 7 constabulary buildings, 5 docks, 4 irrigation ditches, 1 water tank, 6 river controls, 1 dyke, 3 port works maintenance, 1 dam, etc.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

CLAUD RUSSEL, *Director of Public Works (on leave)*
C. E. GORDON, *Acting Director of Public Works (also Chief Constructing Engineer)*
E. C. EARLE, *Acting Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer (on leave)*
JUAN ARELLANO, *Supervising Architect*
TOMAS MAPUA, *Supervising Architect*

Supervising Engineers
L. S. Boggess
J. C. Cookingham
C. S. Dandois
J. T. Marshall
B. F. Mills
A. T. Sylvester

Hydraulic Engineer
G. G. Stroebe

Designing Engineers
E. C. Earle
Jose Paez

Irrigation Engineers
R. H. Shoemaker
Gonzalo Garcia
Luis Francisco

Chief Hydrographer
Nicanor Cortes (acting)

District Hydrographers
F. T. Ryan
W. Demers

Electrical and Mechanical Engineers
L. L. Vincent
W. A. Newton
L. H. Thompson

Structural Engineer
V. L. Legarda

Chief Architectural Draftsman
Cheri Mandelbaum

Architectural Draftsmen
J. Altiveros
C. A. Barretto
A. Toledo

Assistant to the Director
C. A. Tansill

Superintendent of Artesian Wells
A. W. Wolf

Chief Accountant
Rosendo Reinoso

Cashier and Disbursing Officer
Teodoro Camu

Division Clerks
Artemio Abaya
Hilario Reynera
Salvador Reyes

District Engineers
R. N. Allen
Alejo Aquino
A. W. Austin
J. V. Bagtas
Sotero Baluyot
N. R. Baugh
F. H. Campbell
Mamerto Cruz
Maximo Dimson
Leandro Espejo
Severino Fernandez
R. S. Frush
Jose Gandionco
Rufino Garcia
Manuel Gochuico
Domingo Guanio
W. J. Hollis
W. B. Honska
Leon Ines
Agustin Jereza
V. S. Kilby
Isabelo Lagniton
Saturnino Lopez
Juan Macaraeg
Vicente Orosa
Lorenzo Ortiz
C. V. Powers
Mateo L. Roco
N. S. Saleeby
Valeriano Segura
E. D. Smith
Silvestre Tan Chauco
Antonio Tayzon
L. R. Tillett
Dalmacio Urtula
Jose Villanueva

Assistant Engineers
A. C. Babcock
F. P. Reynolds

Overseer
Ross Hagler

Statistical Clerk
M. Limlingan

Law Clerk
Eusebio Barba (acting)

Record Clerk
Primo Villar

Civil Engineers
Pastor Gomez
Manuel Reyes
Teofilo Reyes
T. P. Scates
Pedro Siochi
Julian Vallarta

Assistant Civil Engineers
Melecio Arranz
Graciano J. Militante
Jose Wright
Jaime Laguardia
Manuel Gonzales (N. G. P. I.)

Junior Civil Engineers
Gregorio Alcantara
Alfonso Altimerano
Jose Arquisola
Hilario S. Clemente
Gustavo Cruz
Ambrocio Diaz
Manuel Diaz
Isaias Fernando
Jose F. Imperial
Fidel V. Larracas
Vicente Lavadia
Jose Lozada
Luis Mallari
Teodoro Mocorro
Arturo P. Nitorreda
Marcelo Operario
Emilio Perez
Martin M. Resplandor
Rafael Ungson
Liborio Urtizberea
Gonzalo Vales
Rosalio Villalon

Junior Electrical Engineer
Vicente Villanueva

Superintendent of Automobiles
Juan Piedad

Superintendent of Benguet Auto Line
Pastor Avisado

Property Clerk
Constancio San Jose

Traveling Inspector
Jose del Castillo

P552

BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS
PHILIPPINE ISLANDS

Quarterly Bulletin

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Insane Ward, San Lazaro Hospital, Manila.

166061

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1918

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, P. I., February 21, 1919.

Sir: I have the honor to submit herewith the Report of the Bureau of Public Works for the fiscal year ending December 31, 1918.

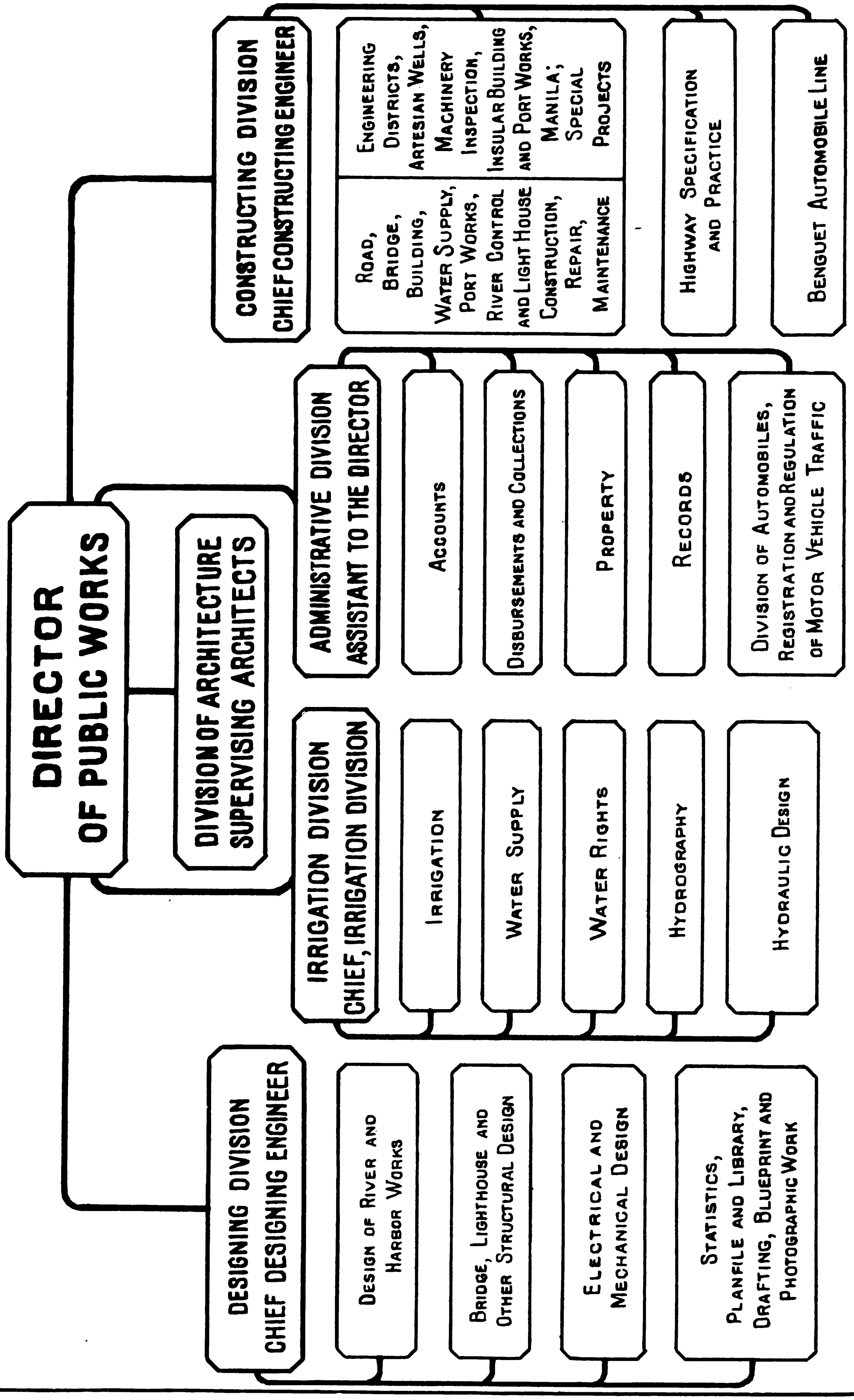
Very respectfully,

A. Gordon
Acting Director of Public Works.

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1918.


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE
SUPERVISING ARCHITECTS
DESIGNING DIVISION
CHIEF DESIGNING ENGINEER
Design of River and Harbor Works
Bridge, Lighthouse and Other Structural Design
Electrical and Mechanical Design
Statistics, Planfile and Library, Drafting, Blueprint and Photographic Work
IRRIGATION DIVISION
CHIEF, IRRIGATION DIVISION
Irrigation
Water Supply
Water Rights
Hydrography
Hydraulic Design
ADMINISTRATIVE DIVISION
ASSISTANT TO THE DIRECTOR
Accounts
Disbursements and Collections
Property
Records
Division of Automobiles, Registration and Regulation of Motor Vehicle Traffic
CONSTRUCTING DIVISION
CHIEF CONSTRUCTING ENGINEER
Road, Bridge, Building, Water Supply, Port Works, River Control and Light House Construction, Repair, Maintenance
Engineering Districts, Artesian Wells, Machinery Inspection, Insular Building and Port Works, Manila; Special Projects
Highway Specification and Practice
Benguet Automobile Line

QUARTERLY BULLETIN

BUREAU OF PUBLIC WORKS
MANILA, P. I.

ISSUED QUARTERLY UNDER THE DIRECTION OF
THE DIRECTOR OF PUBLIC WORKS

C. A. TANSILL, COMPILER

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ORGANIZATION AND PERSONNEL.

During the year 1918, the Bureau passed through a very critical and trying period due partly to the many changes in its personnel and partly to the great difficulty in obtaining construction materials because of the use of shipping in the prosecution of the war, and partly to the very considerable advance in the cost of labor and materials. Such unsettled conditions made it very difficult to even approximate the cost of the estimates. The Bureau had three Directors and lost two of them. It had 11 American designing engineers and it temporarily lost 10 of them, who joined the Philippine National Guard and the Officers' Reserve Corps of the U. S. Army. It had 29 American district engineers and it temporarily lost the service of 13 of them due to the U. S. Army. It lost temporarily 4 Filipino engineers who took service in the National Guard. All the aforementioned changes necessitated the direction of transfers and the assumption of greater duties and responsibilities by those transferred. In the 45 provinces of the Islands there are 12 American district engineers and 29 Filipino district engineers. On the island of Luzon there are 4 American district engineers and 19 Filipino district engineers. In the Visayas there are 3 American district engineers and 7 Filipino district engineers, and in Mindanao and Sulu there are 5 American district engineers and 3 Filipino district engineers.

The activity of the reduced personnel is best indicated perhaps by an examination of the record of accomplishment shown upon page 4 of this report. Such an accomplishment is due to a technically trained direction with able and loyal subordinate support. The Bureau of Public Works being an entity of construction and design, can obtain a maximum result only when its direction possesses a technical training and a broad experience, and such training and experience must have been along the lines of work accomplished and to be accomplished by the Bureau. A minister of the Gospel would not be suitable as a commander of an army; a lawyer would not be suitable as a Director of Health; a doctor of medicine would not be suitable as an attorney-general; and, also, only an engineer will be suitable as a Director of Public Works.

PERSONNEL.

Number of employees paid direct from Bureau funds as of December 31, 1918. Americans, 62, Filipinos, 379.

Number of technical employees as of December 31, 1918; Americans, 37; Filipinos, 88.

Filipino technical employees.

	Classified.	Unclassified.	Total.
Civil engineer	15		15
Assistant civil engineer	16	2	18
Junior civil engineer	16	15	31
Surveyor	1	3	4
Junior electrical engineer	1		1
Supervising architect		2	2
Architectural draftsman	7	1	8
Senior architectural draftsman		2	2
Junior architectural draftsman	1		1
Supervising architectural draftsman	2		2
Assistant architectural draftsman	2		2
Superintendent of autos	1	1	2
Total	62	26	88

CHANGES IN PERSONNEL.

The figures in the following tabulation include all officers and employees under civil-service appointment and engaged upon work supervised by the Bureau, by whatever branch of the Government paid.

	Americans.	Filipinos.	Total, 1918.	Total, 1917.
Number of appointments	12	338	350	217
Number of transfers to bureau	1	11	12	24
Number of separations for cause		14	14	10
Number of voluntary resignations	23	157	180	115
Number of seperations due to economy	1	1	2	11
Number of transfers from bureau		24	24	16
Number of seperations due to retirements	3		3	10
Number of deaths		6	6	10
Total number of employees December 31, 1918	92	1,072	1,164	1,031

NOTE.—Item "number of appointments" include new appointments and probational appointments.

Expenditures supervised by the Bureau of Public Works.

Item.	Insular expenditures.				Provincial and municipal expenditures.		Funds from private sources.		Total	
	Bureau of Public Works		Appropriations controlled by other bureaus.							
	1917	1918	1917	1918	1917	1918	1917	1918	1917	1918
Roads and bridges	70,957.34	93,117.95		3,003.86	6,077,256.11	7,161,794.89			6,148,213.45	7,257,916.70
Buildings	45,087.73	237,570.23	259,680.64	402,706.17	1,430,316.46	1,792,492.55			1,735,084.83	2,432,768.95
Maintenance, alteration and repair of public buildings	199,074.85	223,415.58	81,072.69	50,259.12					280,147.54	273,674.70
River and harbor work including purchase and reconstruction of equipping lights, buoys and beacons	895,485.60	1,051,984.44	7,562.86	23,108.31	21,218.06	29,728.38	19,748.08	24,370.81	944,014.60	1,129,191.94
Artesian wells and water supply	150,693.50	845,709.14	2,307.68	30,699.38	322,419.13	266,944.63	1,715.80	2,427.00	477,136.11	1,145,780.15
Irrigation projects	25,717.38	90,210.43	19,771.74	28,704.83		419.47	847.37	946.84	46,336.49	120,281.57
Tres Cruces and Culong-culong dams			12,560.41						12,560.41	
Operation of auto lines, quarries and the supervision of motor vehicle traffic	179,554.07	252,599.63							179,554.07	252,599.63
Miscellaneous		62,189.08	93,570.02	168,213.36	415,941.84	702,005.09	11,508.69	48,747.34	521,020.55	981,154.87
Total	1,566,570.47	2,856,796.48	476,526.04	706,695.03	8,267,151.60	[a] 9,953,385.01	33,819.94	76,491.99	10,344,068.05	13,593,368.51

[a] This includes ₱142,692.56 of expenditures originally made by the Bureau but subsequently collected from provinces.

Balance sheet, Bureau of Public Works.

		1917.		1918.
Current assets:				
Cash (collecting and disbursing officers)		64,094.09		383,270.17
Supplies and materials		361,010.70		469,050.25
Accounts receivable		359,430.76		612,687.55
Investment and securities		400.00		400.00
Prepayments		1,756.33		4,980.97
Fixed assets:				
Real property and improvements [a]		21,837,464.10		22,997,157.17
Equipment	₱2,034,242.82		2,100,634.80	
(Less depreciation)	1,152,591.70		1,194,127.52	
		881,651.12		906,507.28
Total		23,505,807.10		25,374,053.39

	1917.	1918.
Current liabilities:		
Treasury account	522,345.80	1,120,623.09
Accounts payable	108,922.59	225,523.80
Accrued leave payable	129,170.93	100,181.75
Deferred credits to income	27,718.31	24,060.30
Surplus:		
Appropriated surplus	(1,465.75)	
Principal account surplus (fixed assets)	22,719,115.22	23,903,664.45
	23,505,807.10	25,374,053.39

[a] All previously completed Insular improvements taken up under fixed assets.

Statement of Appropriation, Income and Expense, January 1 to December 31, 1918.

DEBIT.	1917.	1918.
Reversion of unexpended balance of administrative appropriation	56,301.70	133,608.79
Reversion of receipts	926,376.68	580,714.20
Operating expenditures offset by receipts	1,852,811.47	2,714,394.66
Expenditures administrative appropriation	769,884.05	691,126.56
Outlay purchase of equipment	25,015.26	24,923.90
Balance brought forward to 1918	(1,465.75)	
Total	3,628,923.41	4,144,763.11

CREDIT.	1917.	1918.
Appropriation for administrative expense of Bureau of Public Works (expenditures partially offset by surcharges collected)	839,720.00	851,120.00
Balance brought forward from prior fiscal year	10,015.26	(1,465.75)
Receipts—Prime cost	1,852,811.47	2,714,394.66
Receipts—Surcharges	400,049.72	503,252.89
Receipts—Miscellaneous	32,262.24	41,798.59
Gain on supplies sold	1,711.25	2,825.73
Inventory adjustments	3,063.98	3,213.39
Income from rentals	16,580.11	22,943.03
Interest on investment and securities	220.00	180.00
Sales of fixed assets	26,619.80	6,030.11
Prior year's credit	20,869.63	470.46
Proceeds from loan of gold standard fund	425,000.00	
Total	3,628,923.41	4,144,763.11

Transaction Affecting Principal Account Surplus (fixed Assets) During 1918.

	1917.	1918.
Principal account surplus, December 31, 1917	₱1,747,767.17	₱22,719,115.22
Equipment purchase	25,015.26	24,923.90
Equipment acquired by transfer	3,887.83	5,333.62
Fixed property brought into account	21,137,587.13	1,303,370.86
Equipment found at station	17,948.21	348.01
Total	22,932,205.60	24,053,091.61

	1917.	1918.
Equipment sold	₱26,241.33	₱5,974.85
Equipment condemned and dropped	100,219.31	29,003.36
Equipment dropped by transfer	39,440.66	71,938.59
Equipment transferred to supplies	162.53	536.38
Equipment issued to jobs	7,732.55	438.16
Depreciation written off	39,294.00	41,535.82
Principal account surplus, December 31, 1918	22,719,115.22	23,903,664.45
Total	22,932,205.60	24,053,091.61

Operation Statement, Bureau of Public Works.

DEBIT.	1917.	1918.
Operating revenue:		
Rentals	16,580.11	22,943.03
Surcharges	400,049.72	503,252.89
Gain on goods sold	1,711.25	2,825.73
Interest on investments and securities	220.00	180.00
Inventory adjustments	3,063.93	3,213.39
Other service income	32,264.24	42,269.05
Net loss for the year being aid to local governments	306,887.80	112,581.07
Total	760,777.05	687,265.16

CREDIT.	1917.	1918.
Operating expense:		
Supervising, technical and clerical service	575,956.20	501,460.08
Labor	38,730.92	38,767.79
Consumption of materials	55,458.33	61,028.19
Rental of buildings	13,500.00	13,661.46
Illumination and power service	8,323.14	9,277.01
Traveling expense of personnel	28,673.16	27,099.03
Repair service	22,500.00	23,564.62
Postal, telegraph, telephone and cable service	7,759.89	8,569.97
Other expense	9,875.41	3,837.01
Total	760,777.05	687,265.16

The larger results of the year's work.

Surfaced roads constructed and designated first class	kilometer	351.5
Reinforced concrete bridges and culverts completed (In this figure, concrete pipe culverts are not included)	number	81
Successful deep wells completed	do	165
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	number	34

Expenditures supervised during the year.

		Compared with 1917 this is an increase of— *Per cent.*
Total expenditures	₱13,593,368.51	
Total expended upon road and bridge work	7,257,916.70	18.5
Total expended upon building work	2,706,443.65	34.3
Total expended upon port works	1,129,191.94	19.5
Total expended upon water supply	1,145,780.15	140.1

Expenditures on miscellaneous items account for the balance.

ROAD WORK.

Length of Road in Existence.

	December 31, 1918.	December 31, 1917.
	Kilometers.	*Kilometers.*
First class	4,090.2	3,738.7
Second class	2,015.8	2,056.6
Third class	3,128.7	3,393.6
Total	9,234.7	9,188.9

Relation of first-class road construction and maintenance.

Fiscal year ending—	Designated first-class road at end of year.	First-class road constructed during year.	Average maintained throughout the year by the caminero system.
December 31—			
1914	2,495.5	330.2	2,317.6
1915	3,064.0	499.5	2,732.4
1916	3,436.2	368.5	3,226.8
1917	3,738.7	299.1	3,616.1
1918	4,090.2	351.5	4,023.4

The term "designated first-class road" means surfaced road maintained by the caminero (cantonnier) system under specific agreement between the Insular Government and each separate province.

DEFINITIONS FOR ROAD CLASSIFICATIONS.

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing.

	December 31, 1918.	December 31, 1917.
	Kilometers.	*Kilometers.*
Stone	1,380.7	1,221.0
Gravel	2,838.0	2,657.8
Coral	1,127.6	1,035.5
Unsurfaced	3,888.4	4,274.6
Total	9,234.7	9,188.9

ROAD MAINTENANCE.

Average number of kilometers maintained.

	1917	1918
Caminero system	3,616.1	4,023.4
Gang system	3,057.0	2,773.5
Total	6,673.1	6,796.9

Total cost of road maintenance.

	1917	1918
Caminero system	₱2,143,887.68	₱2,756,810.70
Gang system	560,258.92	589,450.32
Total	2,704,146.60	3,346,261.02

Average cost of maintenance per kilometer per year.

	1917	1918
Caminero system	₱592.87	₱685.19
Gang system	183.27	212.53

The length of road designated first class and the length of road under caminero maintenance are as nearly identical as conditions permit.

The higher cost as compared with the previous year may be attributed partially to increased labor and material costs but largely to the destructive effect on highways of heavy motor traffic and the rapidly increasing number of motor vehicles.

BRIDGES.

Durable bridges and culverts in existence.

Fiscal year ending—	All durable structures.	
	Total number.	Increase during year.
December 31—		
1914	6,206	305
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	56

NOTE.—The term "Durable Bridges and Culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The increase in the number of structures is not identical with the number of structures built, not only because with the extension of the work of the bureau to new territory the old work existing is reported for the first time, but also because of the occasional loss of a structure. The above figures are obtained from semiannual reports of district engineers.

Reinforced concrete structures in existence.

Fiscal year ending—	Total number.	Total meter span.
December 31—		
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other clases of construction.

BUILDINGS.

The figures in the tabulation below exclude all structures of less than 100 cubic meters in content:

All durable buildings completed.

Fiscal year ending—	Total number.	Total content cubic meter.	Reinforced concrete by content.
December 31—			*Per cent.*
1914	136	370,723	92
1915	154	522,746	76
1916	112	261,496	85
1917	82	160,888	70
1918	84	220,943	56

Buildings, in these tabulations, are classified as reinforced concrete when the outside walls, or, in the case of markets, the interior posts, are of that material.

Number of markets and schools completed.

Calendar year.	Markets and tiendas.	Schools.
1914	51	69
1915	54	72
1916	17	67
1917	15	32
1918	19	27

ARTESIAN WELLS.

Successful deep wells driven by fiscal years.

1915	139
1916	122
1917	108
1918	165

A total of 893 artesian wells are now supplying potable water to the inhabitants of the Philippines.

Total expended upon wells, 1918.

	1918		1917	
		Per cent.		*Per cent.*
Successful wells	₱274,986.79	82	₱199,022.40	90
Unsuccessful wells	59,278.25	18	20,273.40	10
Total	334,215.04	100	219,295.80	100

	1918.	1917.
Average cost of drilling per meter	₱25.22	₱21.33

Summary of deep-well driving 1918.

	Number.	Total depth.	Total flow per minute.
Successful:		*Meters.*	*Liters.*
Flowing	71	5,344	10,064
Pumping	94	5,611	12,026
Total:			
Successful	165	10,955	22,090
Unsuccessful	14	2,268	....

	1918.	1917.
Percentage of unsuccessful wells drilled	8	8

The new wells completed in 1918 furnish potable water to a population of approximately 230,000.

The average cost of drilling these new wells, including materials and supplies, depreciation of equipment and other charges, such as labor, transportation, etc., was ₱25.22 per meter or ₱7.68 per foot, which is considered very satisfactory, considering the increased cost of supplies and materials due to the war.

For the first six months of 1918, twenty-one drilling machines were in operation throughout the islands, but owing to the great demand for artesian wells in the municipalities where no drilling had been undertaken before, two more machines were put in the field by the middle of the year, making twenty-three drilling outfits operating during the remainder of 1918. One of the two additional machines was bought from the Philippine Railroad of Iloilo, and the other was reconstructed from parts of machines which had been out of commission for lack of essential spare-parts.

One hundred and seventy-nine wells were completed in 1918, fourteen of which were unsuccessful.

In Mindoro Province, very good results were obtained, water flowing at an average of 130 gallons per minute.

The drilling of artesian wells in 1918 has suffered some delays, as supplies could not reach the drilling outfits on time in some remote places where transportation facilities are difficult. Also the epidemic (Trancazo) that swept the islands, about the later part of the year, contributed largely to a more or less suspension of work totalling several days.

Orders have been placed in the United States for supplies and materials, equipment and machinery valued at ₱200,000. It is intended to put from 25 to 30 drilling machines in operation during the year 1919, as the demand for wells is constantly increasing.

MOTOR VEHICLES.

It is recommended that owners' licenses to drive motor vehicles now issued free of charge to persons having registered one or two automobiles in their name, as well as Government licenses issued in the same manner to heads of Bureaus or Offices, be abolished. Licenses should be secured by the payment of two pesos the same as licenses issued to professional drivers. In other words, it is recommended that no licenses be issued free of charge.

Attention is invited to the desirableness of amending the present motor vehicle law so that a more equitable application of the cost of maintenance of the roads may obtain. The registration fees are too low and such, that the motor vehicle owners fail to pay their just and proper share of road use. Metal tires should not be permitted upon the roads; these tires should be prohibited equally with the narrow tire which has been prohibited for years. The permissible gross load should be reduced to not to exceed four metric tons. The present tax of ₱0.20 per horse power should be increased to at least ₱1 per horse power.

The automobile equipment of the central office includes 15 touring cars and runabouts of various makes and 5 trucks. These cars are in constant use, being employed not only in the activities of the Bureau but also under regular assignment to the Executive Bureau, the two branches of the Legislature and the Philippine National Guard. A great amount of transportation, other than that on regular assignments, has been furnished to many branches of the Insular Government. The total operating cost for the Manila automobile division was ₱40,759.34, and ₱9,367.00 of this amount is properly chargeable to other Bureaus for transportation furnished.

THE OPERATION AND REGISTRATION OF MOTOR VEHICLES.

The principal taxes imposed on motor vehicles in the Philippines are:

Vehicle tax.	First ton of capacity.	Each additional 500 kilos.
Trucks with metallic tires	₱50.00	₱4.00
Trucks with rubber tires:		
Passenger	10.00	2.00
Freight	25.00	3.00

Other four-wheel motor vehicles operated for hire ₱0.20 per horse-power plus ₱20.

Motorcycles of two or three wheels, ₱3.

All other motor vehicles, ₱0.20 per horse power.

For the fiscal year 1918 motor vehicles were registered as follows:

New registration	number	1,301
Re-registration	do	6,078
Total		7,379

Vehicles previously registered and withdrawn from service number 49.

Of the total registration, 1,143 motorcycles and other motor vehicles having less than four wheels are included.

The funds collected during the year under existing law total ₱84,243.74 utilized as follows:

For the payment of salaries, wages, purchase of equipment and other expenses incurred in the enforcement of the law	₱64,787.00
Balance	19,506.74

In the licensing of operators 3,500 applicants were examined and 3,259 new licenses issued. Including renewals 8,150 drivers were licensed to operate motor vehicles.

THE BENGUET AUTOMOBILE LINE.

This line is a very important one in that it provides transportation for thousands of people who, annually, seek a temperate climate in a tropical latitude. The line operated during the year 6 touring cars, 9 passenger trucks, and 6 freight trucks with 2 trailers. Even this motor vehicle equipment, at times, was insufficient to meet the demands which the popularity of the mountains induced. The popularity of Baguio as both a health and rest resort is increasing greatly as time rolls on.

In addition to the personal travel, increasingly large quantities of temperate zone vegetables, which are grown in the cool altitudes, are transported over this line to the markets of Manila and the low lands. The following tabulation, it is believed, will indicate the volume of traffic which has passed over this line during the year:

The Benguet auto line handled from January 1st to December 31st, 1918.

First-class passenger.	Second-class passenger.	Hand baggage.	Express and freight.
Number.	*Number.*	*Kilos.*	*Kilos.*
2,158	3,356	398,168	561,431

THE PRESENT USE OF THE BENGUET AND NAGUILIAN ROADS.

Because of the imminence of the abandonment of the Benguet Road, a comparison of the traffic over it, with the traffic passing of the Naguilian should be of especial interest. It will be noted that, already, in some traffic features, the newer road excells the older one.

Summary of traffic over the Benguet and Naguilian Roads.

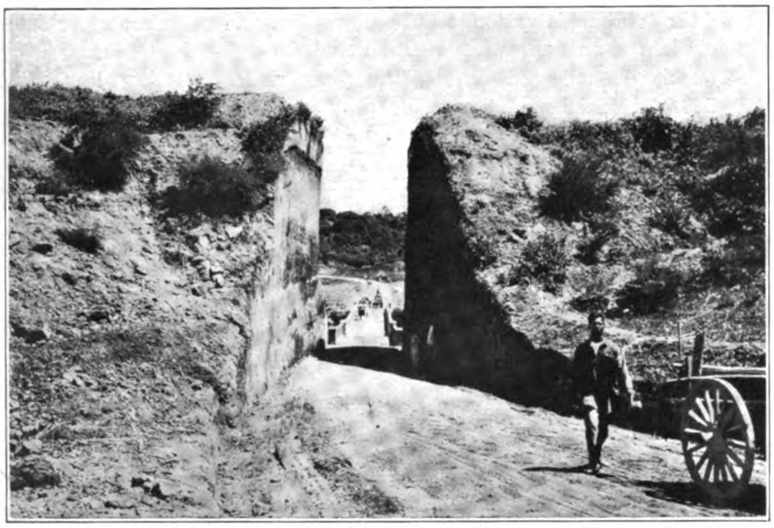
	Pedestrians.	Bull carts.	Animals led or riden.	Calesas.	Motorcycles.	Auto passengers.	Auto trucks.	Wagons.
BENGUET.								
Jan. 1 to Mar. 31	2,992	1,638	88	....	11	952	1,062	....
Apr. 1 to June 30	2,482	1,873	286	....	21	1,800	950	....
July 1 to Sept. 27	1,405	1,035	1,016	1	5	265	489	....
Oct. 1 to Dec. 31	1,887	2,038	943	....	9	502	1,000	....
Total	8,766	6,584	2,333	1	46	3,519	3,501	....
NAGUILIAN.								
Jan. 1 to Mar. 31	2,295	3,606	613	39	65	723	1,254	413
Apr. 1 to June 30	1,975	4,037	946	49	54	1,388	967	541
July 1 to Sept. 27	1,860	2,299	947	28	41	259	750	5
Oct. 1 to Dec. 31	3,155	2,669	350	10	51	620	525	7
Total	9,285	12,611	2,856	126	211	2,990	3,496	966

CONSTRUCTING DIVISION.

C. E. GORDON, Chief Constructing Engineer.
A. T. SYLVESTER, Supervising Engineer, in charge.

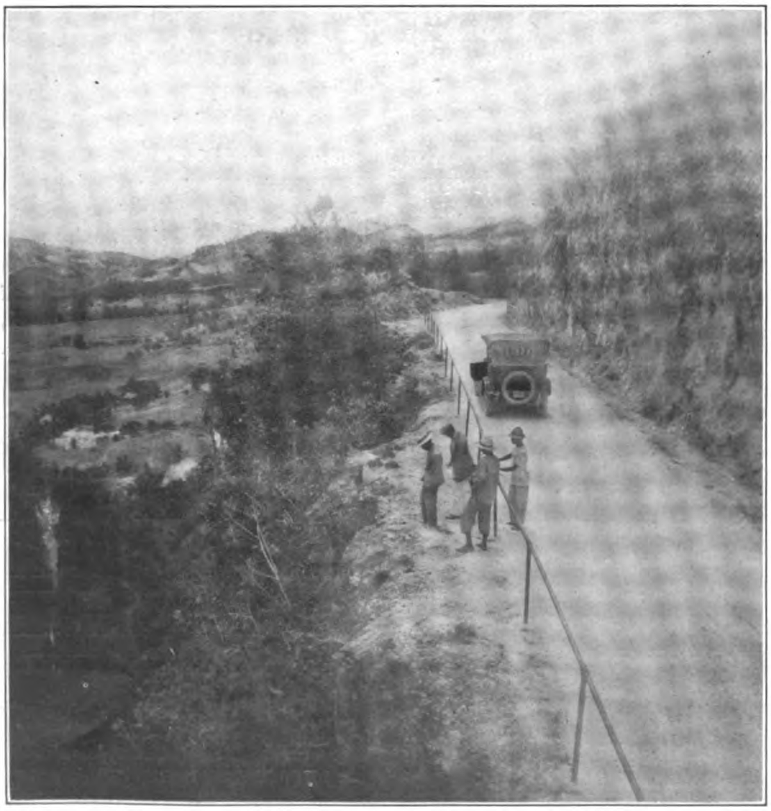
ROADS.

The extension of the first-class road system was continued in all provinces, and in several instances considerable additional first-class road was declared, noticeably Bohol, with 47.0 kilometers, Occidental Negros, with 32.5 kilometers and Pampanga and Pangasinan with 24.5 and 19.8 kilometers, respectively.



South approach Sabang Bridge, Batangas-Ibaan Road, Batangas Province.

While phenomenally large increases in the development of the separate provincial systems of first-class road are not to be expected where the expenditures for maintenance approach the limit of funds available, it is, nevertheless, evident that the policy of adopting a systematic construction program, based on the transportation requirements and financial ability of the individual province, is now beginning to bear fruit. Cebu, Pangasinan, Pampanga and Batangas are excellent examples of such a constructive policy.

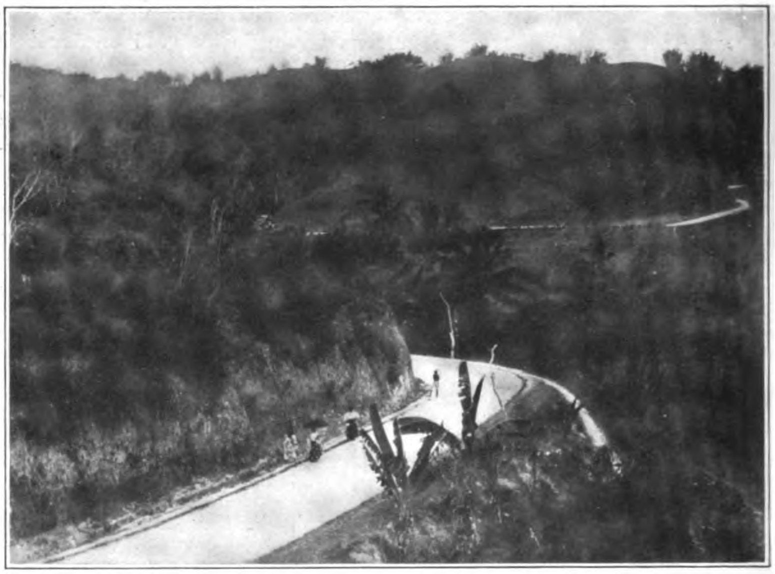


25064. A shelf section, Carcar-Barili road, Cebu. April 28, 1919.

The consolidation of the various provincial road systems, into a connected whole, by means of inter-provincial and intracoastal roads, has proceeded steadily. The allotment of ₱60,000 to the Province of Iloilo and the balance of funds available in Antique for the construction of the Iloilo–Antique interprovincial road permitted the effective continuation of work on this important project. Approximately 15 kilometers of the grading has been completed and 10 kilometers of metalling finished. The northern section of Antique is being connected to the Aclan Valley portion of Capiz by means of the interprovincial road from Navas to Pandan, for which an allotment of ₱25,000 was provided. Progress on construction of this road was satisfactory and it is expected that the Capiz portion will be completed shortly after the New Year. These two roads will solve a most difficult transportation problem.

The Pampanga–Bataan inter-provincial road lacks only the surfacing on 8.0 kilometers. The allotment of ₱25,000 which is proposed for 1919, will complete this important traffic route, which traverses a fertile, rolling country, and serves not only as a connecting link between the road systems of Bataan and Pampanga, but as a feeder to the railroad, as well.

An allotment of ₱50,000, which was provided for the construction of a road from Pagsanjan to Luisiana, Laguna Province, was expended in opening up a horse and construction trail, on the approved alignment and grade for a first-class road. Located high up on the foot-hills of Mount Banahao, this road will serve as an oulet for the towns of Luisiana and Cavinti, connecting with the latter by means of a short branch-road, and will be incorporated in the through route from Lucban, Tayabas Province to Santa Cruz and the Laguna road system.

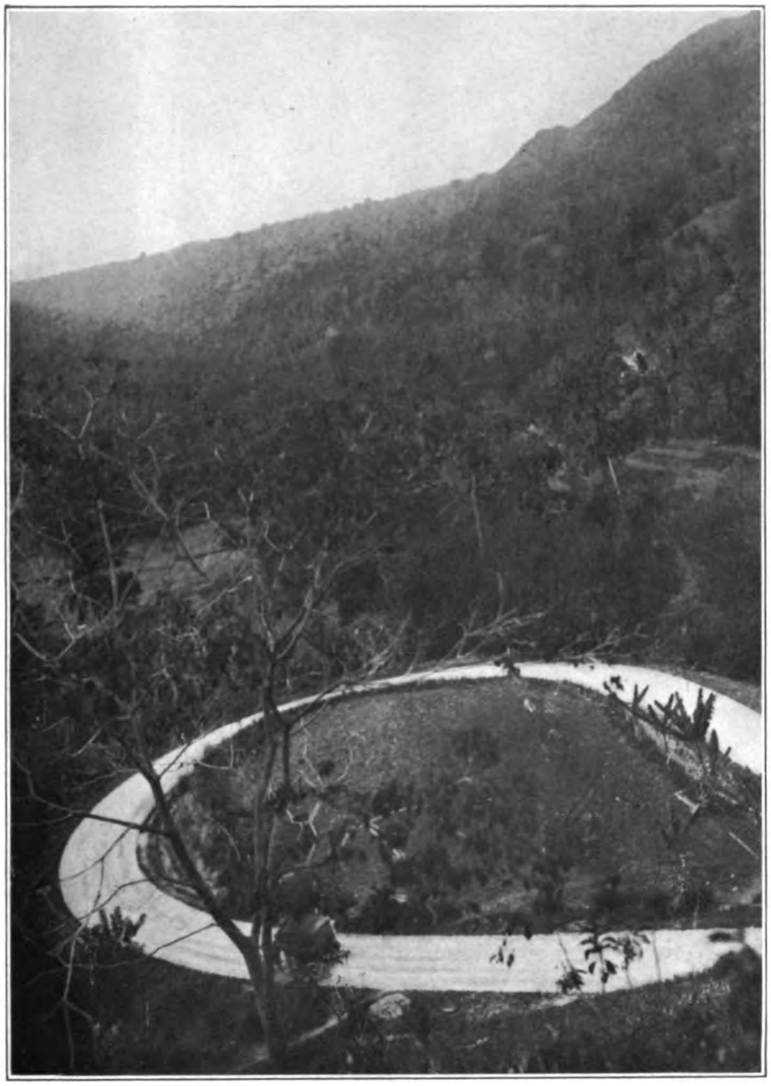


5529. Laoay-Interior Road, Bohol.

Of the ₱102,897 available during 1918 for the construction of the Bolbok–Candelaria inter-provincial road, a total of ₱55,000 was expended, and the grading completed. Surfacing could not be undertaken for lack of road-roller equipment, but the entire project, less the bridging of the Malaking Ilog River, should be completed during 1919. This road, in connection with the Rosario-Bolbok project, will provide for the large traffic between Batangas and Tayabas and will give the eastern part of Batangas connection with the railroad at Candelaria.

Satisfactory progress was made on the Manila–Tarlac road between Magalan, Pampanga, and Concepcion, Tarlac. The Pampanga section was completed, less a few small culverts and the Tarlac section was completed south as far as the Santiago River. It is expected that this road will be open to traffic during the ensuing year.

Heavy grading was accomplished in the continuation of the Bangui (Ilocos Norte) Claveria (Cagayan) road. The work consists of con-



5546. A loop on the Loay interior road on kilometer 26, Bohol. April 22, 1919.

structing a horse-trail along the precipitous north coast of Luzon between the two towns and involves difficult location and construction work. This route is of great importance during the northerly monsoon season.

Considerable work has been accomplished on the Nueva Ecija-Nueva Vizcaya inter-provincial road. Subgrade construction has reached the approaches to the divide, and very heavy grading is required. A horse trail has been constructed along the entire route and approximately 15 kilometers graded. In some cases it has been necessary to suspend the laborers by ropes, because of the steepness of the mountain sides forming the cañon through which the road is located. Through the efforts of the Director of the Bureau of Non-christian Tribes, 1,500 Ifugao laborers were secured and successfully employed on the project. The trancazo epidemic was particularly inopportune, in that it created a panic among these laborers which resulted in flight to their mountain homes. It is assured, however, that they will again be available for the coming working-season. A wage of ₱0.50, with rations, is paid these laborers.

The total liabilities and expenditures for the year on this were ₱157,500, approximately, leaving a balance of about ₱76,800, which with the proposed allotment of ₱70,000 will permit of the uninterrupted prosecution of the work during 1919.

On the Albay–Sorsogon, inter-provincial road a total of 9 kilometers of finished road were reported at the end of 1918, together with a considerable amount of completed subgrade. A total of ₱52,614 was expended by the Province of Albay, and ₱41,278 by the Province of Sorsogon.

Zigzag Camp One–Aringay Road at kilometer 253, La Union.

Progress was made on the extension of the Cagayan Valley trunk road in Nueva Vizcaya, Isabela and Cagayan. Grading on the Naga-Pasacao road in Ambos Camarines reached the town of San Fernando, and extensive trail work was undertaken in the Mountain Province and the Department of Mindanao and Sulu.

Numerous road surveys were executed during the year and the customary plans and estimates prepared. The survey of an inter-provincial road between Bataan and Zambales was begun, and a location determined for the important Baybay–Abuyog road in Leyte, on which construction is well under way.

A large amount of road work was done with purely provincial funds and in some cases, municipalities have had street construction and maintenance done by the district engineer, noticeably in Pampanga, Laguna, Tayabas and Iloilo.

The cost of road work throughout the Islands was slightly higher than usual, owing largely to the scarcity and increased cost of labor.

BRIDGES.

While bridge construction has been somewhat curtailed during the past year, owing to the lack of materials in the local market, it has been possible, nevertheless, to erect several important structures.

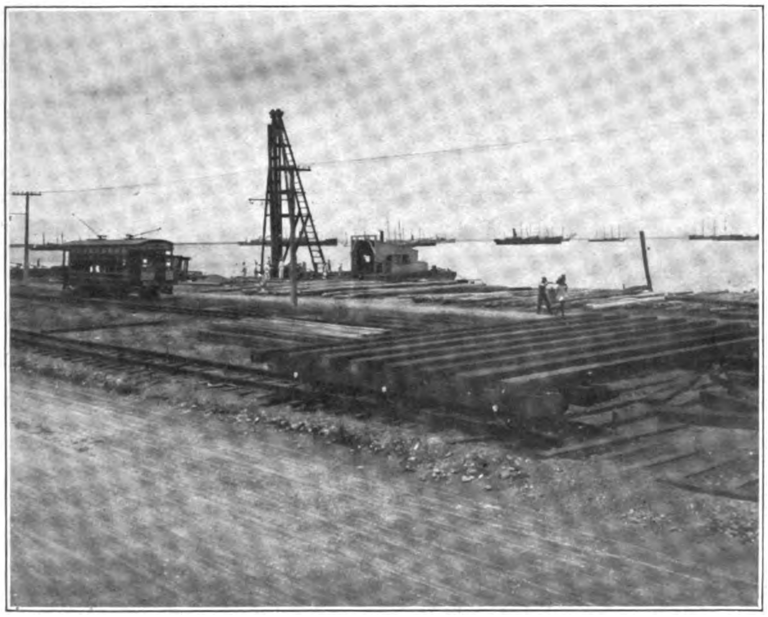
Luguit Culvert at kilometer 258.44, Camp One–Aringay Road, La Union.

The Santiago River bridge, on the Manila–Tarlac Road, between Concepcion and Magalan, was practically finished at the end of the year. It consists of a steel truss span of 46.0 meters and 3 approach spans of standard slab and girder construction, the whole aggregating 74.5 meters in length. This structure closes the last important bridge gap in the through highway route between Manila and Tarlac. The cost of this project, up to December 31st, 1918, was ₱45,230, the work being done by administration. Navotas Bridge, at Navotas, Rizal, is of the standard slab and girder concrete type, supported on concrete pile bents. It is composed of nine 9.0 meter spans with ornamental balustrade and heavy rock-filled approaches. The total cost of this bridge was ₱65,984. This was an administration project. The steel bridge at Camiling, Tarlac, was completed and opened to traffic early in the year.

A notable example of the so-called over-flow type of bridge was completed across the Imbang River, on the Silay–Guinbalaon road, Occidental Negros. At a cost of about ₱30,000, a concrete structure with a clear road way of 5.0 meters and a total length of 185 meters was constructed. The ordinary flow of the river is provided for by twelve lines of pipe 50 centimeters in diameter, while flood waters are expected to pass over the structure, aprons and curtain walls having been provided to prevent under-scour.

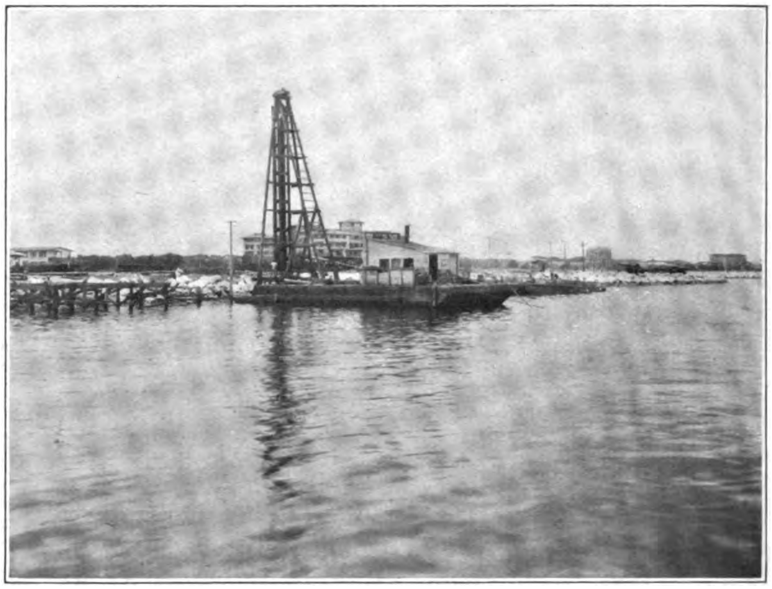
PORT WORKS.

The port-works activities of the Bureau during 1918 were confined to the continuation of projects already underway and the study of various future developments.



Preliminary Construction Work, Pier No. 7, Manila.

At Manila, the construction of the cargo-shed between piers Nos. 3 and 5 was greatly retarded by the unsettled condition of both the labor and material markets. The back-fill placed in 1917 settled so much that it was necessary to seal the space immediately behind the bulkhead curtain wall with cement grout. This operated to delay the completion of the project very seriously. The work was well under way at the close of the year, however, and will add materially to the cargo disposal facilities of Manila when completed. The pile-fender systems for Piers Nos. 3 and 5 could not be constructed, because of the impossibility of securing suitable piles. The difficulty of securing timber piles is a very serious problem, as they are essential to the maintenance of fender systems for the wharves throughout the Islands.



Preliminary Construction Work, Pier No. 7, Manila.

Of the allotment for the purchase of port equipment, ₱40,000 was expended for the dredge "America," which will be reconstructed at Cebu.

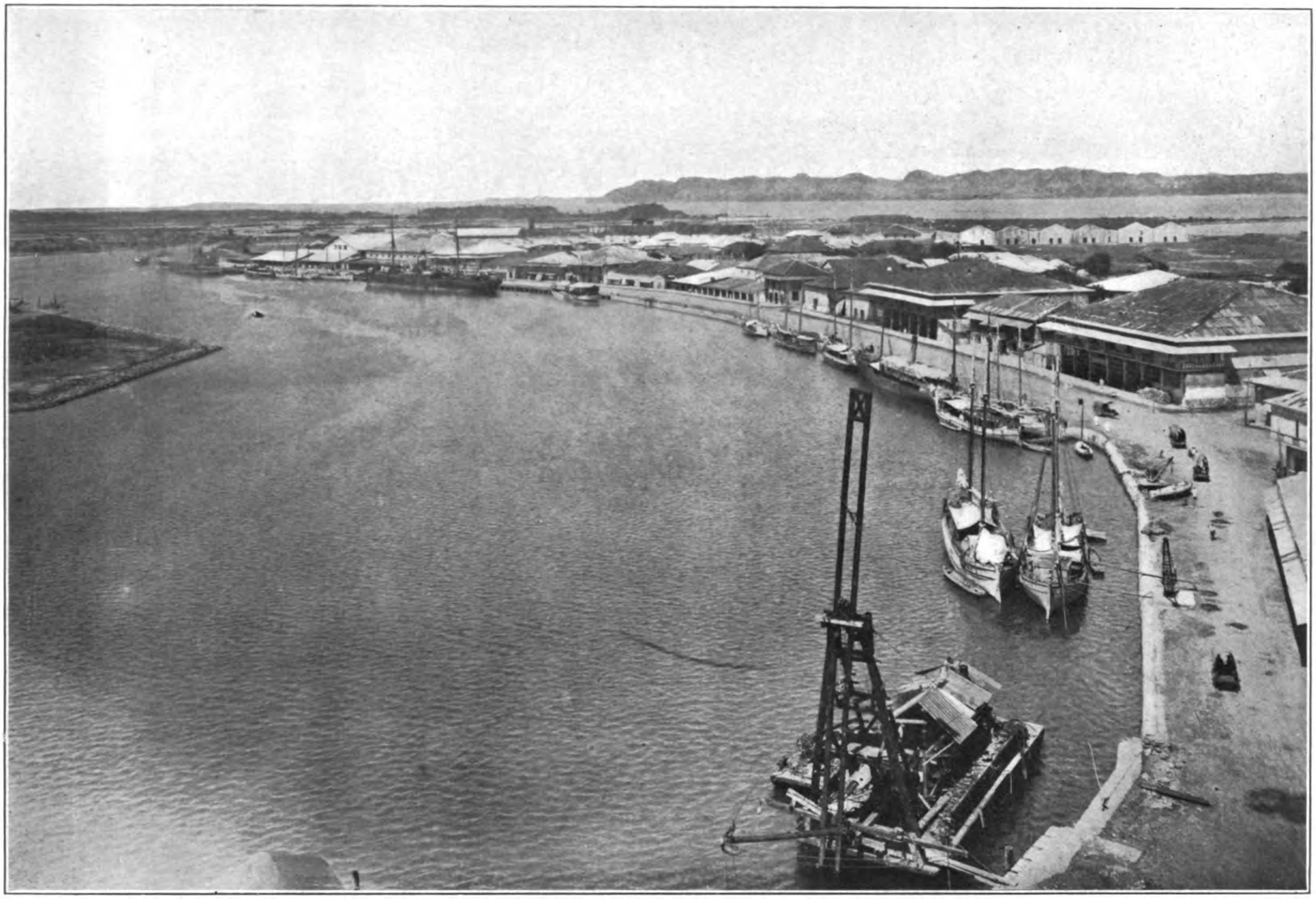
At Tacloban, Leyte, the wharf construction was continued, and a dredge assigned to make the necessary back-fill, which has been practically completed. Leyte asphaltic limestone will be used as a surfacing material for the deck of the wharf and driveways on the immediate port area.

At Tagbilaran, Bohol, the channel through the outer reef was completed and the port is now open to interisland steamers of large size.

Ship landing at Cebu Port, Cebu.

At Cebu, the reclamation of the area inside the new dock extension was delayed through the break down of the dredge early in the year, necessitating its repair at Manila. The construction of the proposed pier was begun. The continuation of this work during the ensuing year will make a marked improvement in the shipping facilities of this important port.

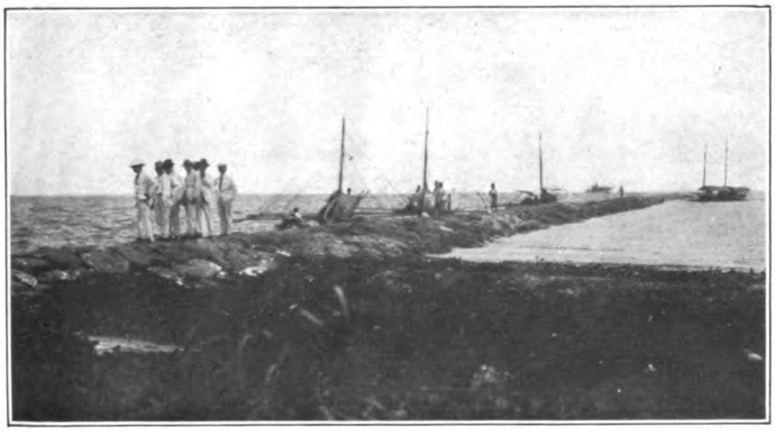
At Iloilo, the river wall was extended to the south end of the landing in front of the new Custom House. Improved construction methods resulted in more rapid progress than had heretofore been attained, at the same time reducing the cost to ₱35 per cubic meter



25074. Panoramic view of Iloilo harbor, Iloilo. April 24, 1919.

for the concrete, in place, including piling and reinforcement. Of the ₱120,000 available for the river-wall and jetties, ₱83,000 were expended. Negotiations are underway to secure the land necessary to construct a turning-basin opposite the Custom House. The dredging of the Iloilo River was continued until funds were exhausted. Considerable land reclamation was accomplished with the dredge spoil—a feature of the work which is of great importance.

The rock-fill break water for the port at Dumaguete, Oriental Negros, was advertised for bids, but no tenders were received. With the additional funds recommended for 1919, it will be possible to offer a more attractive proposition to contractors, by reason of the larger amount of work which can be undertaken.



5541. View of Calbayog Jetty, Samar. April 22, 1919.

At Catbalogan, Samar, the construction of a causeway, for which a total of ₱80,000 was available, was undertaken by contract and approximately 150 lineal meters were completed. When finished, a depth of water, at low tide, of six meters at the extremity of the causeway, will permit the largest ships calling at Catbalogan to tie-up along side. The entire appropriation was expended.

Surigao Wharf, Surigao Province.

At Aparri, the improvement of the port was continued, and a channel dredged permitting ships to enter the river without difficulty. In Mindanao and Sulu, wharf reconstruction was carried on at Overton, Davao and Jolo and the new structure at Zamboanga begun in 1916 was completed.

At Catarman, Samar, river control work in the form of wooden pile hurdles was begun and one hurdle completed. The use of this type of hurdle is still in an experimental stage, those constructed at Boac in 1917, having required considerable repair during the past year.

LIGHT HOUSE CONSTRUCTION AND REPAIR.

A standard 28-foot concrete beacon was constructed at Bantolinao Point, Mactan Island, Cebu, and the Little Santa Cruz, Light-house station at Zamboanga was reconstructed. A 3,000 gallon water cistern was completed for the Gigantes Lighthouse. The usual maintenance of lighthouses and beacons was executed. A ship should be assigned permanently to work of this nature, in view of the isolation of most of the light stations, and the exigencies of weather conditions.

A steel tower, 50 feet high, was constructed at the Little Santa Cruz light; one concrete beacon, 28 feet high, at Bantolinao lighthouse; and one 3,000 gallons cistern was constructed at Gigantes lighthouse. Considerable repair and maintenance was accomplished which is set forth in the following tabulation of details:

Job No.	Title.	Miscellaneous charges.	Salaries and wages.	Materials.	Surcharges.	Total.
12894	Cape Melville	₱237.00	₱1,912.40		₱193.45	₱2,342.85
12900	Tanguingui light			₱80.26	7.22	87.48
12917	Cape Engaño	127.60	2,584.84	2,241.30	445.83	5,399.57
13295	Gigantes lighthouse			38.91	3.50	42.41
13293	Bagacay lighthouse	193.77	433.98	451.57	97.13	1,176.45
13917	Capones lighthouse	66.43	1,723.73	1,146.52	264.30	3,200.98
13550	Balabac wharf	310.28	1,871.97	141.39	209.13	2,532.77
14140	Little Sta. Cruz Zamboanga	173.60	1,117.50	1,645.14	264.49	3,200.73
14246	Bantolinao lighthouse	486.42	934.47	1,084.42	225.48	2,780.79
		1,595.10	10,578.89	6,829.51	1,710.53	20,714.03

DREDGING.

The dredge equipment of the Bureau was in fair condition only at the beginning of the year, and numerous break-downs have reduced the dredging accomplished during the past twelve months. The acquisition of the dredge "America" and its reconstruction, will add materially to this class of equipment, but it is necessary that dredges Nos. 2, 3 and 6 be thoroughly overhauled and that the scow equipment be augmented, if the increasing demands of foreign and domestic shipping are to be met. The following tabulation indicates the localities where dredging work was done, and the amount.

Dredging operations, 1918.

Locality.	Total from 1902 to 1917.	Fiscal year 1918.	Total.
	Cu. meter	*Cu. meter*	*Cu. meter*
Lower Pasig River	5,912,727	95,869	6,008,596
Outer Harbor	2,243,731	215,617	2,459,348
Upper Pasig River	667,252	7,793	675,045
Inner Basin	395,430	13,523	408,953
Binondo Estero	52,816		52,816
Estero de la Reyna	232,922		232,922
Paco Estero	17,440	9,525	26,965
San Miguel Estero	56,206	590	56,796
Proviso Estero	27,744		27,744
Marine R. R. Engineering Island	30,865		30,865
Talim Island (city)	1,071		1,071
Outer Bar	534,701	226,230	760,931
San Sebastian Estero	3,556		3,556
Magdalena Estero	16,580		16,580
Engineering Island Canal	30,180		30,180
Vitas Estero	240,827	55,323	296,150
Quiapo Estero	12,507		12,507
Cegado Estero	35,509		35,509
Pandacan Estero	172		172
Estero de San Lazaro	22,975		22,975
Corregidor Bay Quartermaster	54,956		54,956
Iloilo River	1,527,073	67,325	1,594,399
Cebu Harbor	175,984	36,700	212,684
Mariquina River	7,290		7,290
Balete Estero	21,646		21,646
District of Cavite	20,876		20,876
Tondo Beach	8,000	1,013	9,013
Santibañes Estero	19,762		19,762
Tanque Estero		10,500	10,500
Tacloban Wharf		34,105	34,105
Zamboanga		29,880	29,880
Cotabato River		11,350	11,350
Total	12,370,799	815,343	13,186,142

WATER WORKS CONSTRUCTION.

A large amount of investigation and field work was performed in the study of water supply systems and the data now submitted to the Designing Division. Construction along this line of Bureau activity was greatly hampered by restrictions on the shipment of pipe and fittings from the United States due to the war.

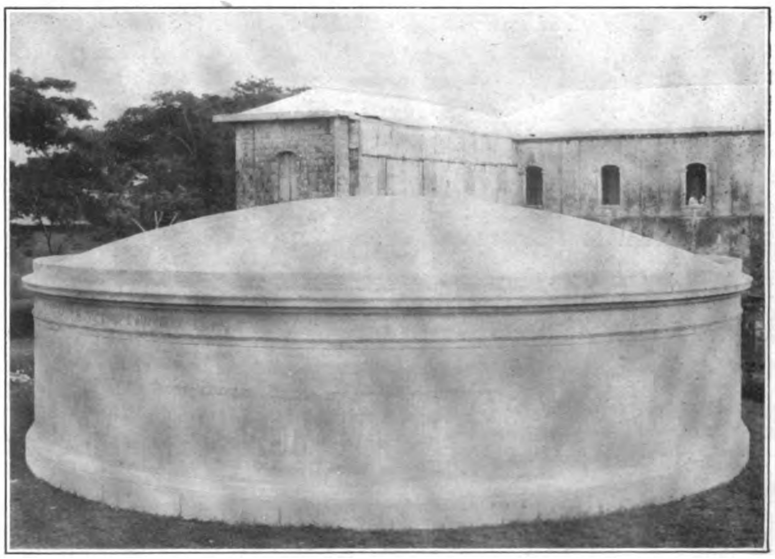
Work was started on the Barili system, for the town of that name, in Cebu, and was about 70 per cent completed at the close of the year. The waters of Bolocboloc Spring, situated about two kilometers east of the poblacion and 16 meters above the plaza, will be conveyed through a four inch cast iron main to the distribution system, which is of two and one half and two inch galvanized iron pipe. Future growth of the town can be taken care of by utilizing the waters of another spring located about 4 kilometers from the town. The work is being done by administration.

At Batangas, the installation of a water supply system, using artesian wells as a source of supply, was completed, with the exception of the installation of the pumping machinery, which has been under order for some time from the United States. The water will be pumped to a concrete reservoir having a capacity of 115,000 gallons. Favorable conditions permitted the reservoir to be designed and constructed with a dome-shaped roof having a span of 16.0 meters and only 10 centimeters thick. The side walls are of the same thickness. A booster-pump will afford ample fire-protection pressure. The system, complete, is estimated to cost approximately ₱54,000.

Construction of a small system to supply water for domestic purposes to the town of San Jose, Antique, was begun during the year. Water will be pumped from a spring, about three kilometers from the town, to a 40,000 gallon tank and then distributed by gravity. A four inch cast iron main, with two inch galvanized iron distribution system will be installed. The estimated cost is ₱30,500.

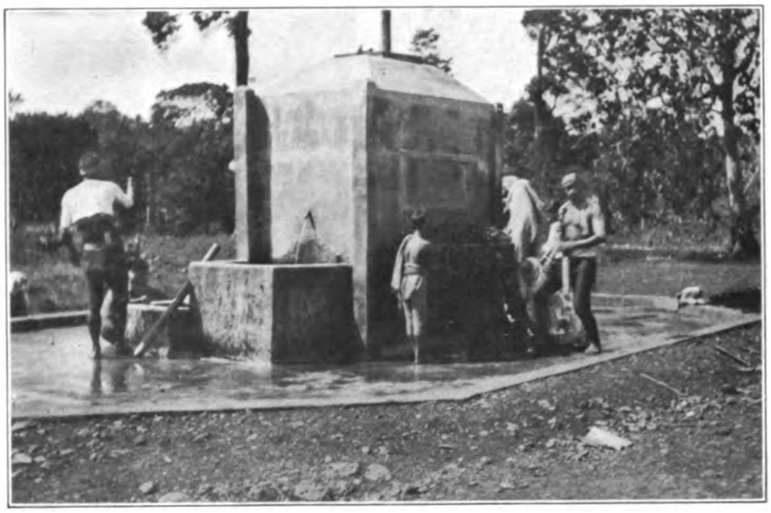
The Tagbilaran, Bohol, system, which has been in successful operation for some time, was extended to supply water to Dawis. A meter system will permit of accurate apportionment of the pumping costs.

Pagsanjan, Laguna, will be amply supplied with water by a water works system, the construction of which was under way at the close of 1918. The water will be pumped from an artesian well having a normal flow of 500 gallons per minute to a 115,000 gallon tank 50 meters above the town by means of a multi-stage centrifugal pump driven by a semi-Diesel crude oil engine. The distribution system consists of a six inch cast iron main, with service lines of four inch cast iron and smaller galvanized iron pipe.



Concrete Water Tank at Capiz, Capiz.

The greater part of the pipe and fittings for the combined water works system for Tayabas and Lucena, Tayabas Province, was received from the United States and hauled to the site of the work late in the year. The preliminary clearing of the head-works site was begun and the construction program outlined before the close of the year. The springs forming the source of supply are located on the side of Mount Banahao, and are about 4.5 kilometers from Tayabas and 14.5 kilometers from Lucena. A six-inch main will conduct the water to a 100,000 gallon reservoir above the town of Tayabas, whence an eight inch line will supply the distribution system of Tayabas, which after passing through the town of Tayabas is reduced to a four inch main to the 400,000 gallon reservoir of the town of Lucena. An eight inch main will carry the water from the reservoir of Lucena to the distribution system of that town. A static pressure of 100 pounds per square inch will be maintained at the hydrants. Cast iron pipe will be used throughout. The estimated cost of the work is ₱325,000.

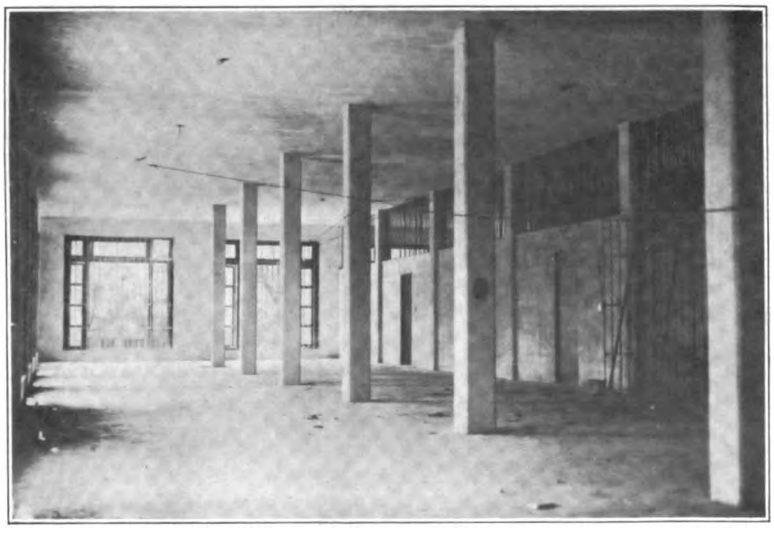


Sanitary Drinking Fountain, Indanan, Sulu.

The Jolo, Sulu, water supply system was completed in October, 1918. It consists of small impounding dam at the Gandasubig Spring, 2.5 kilometers from the city, whence the water is pumped by hydraulic rams to a 130,000 gallon reservoir. A double seven inch main and suitable supply service lines distribute the water to consumers. The spring flow of 1.5 million gallons per day is ample for the future growth of the city.

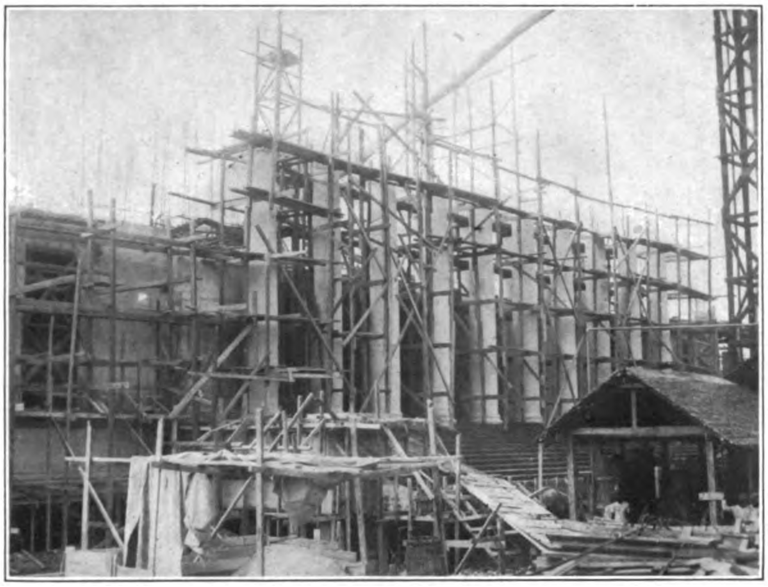
BUILDINGS.

The Pangasinan capitol building at Lingayen was completed near the close of the year. Reinforced concrete, with hard-wood finish where necessary, was used throughout. A distinct departure from previous architectural treatment of public buildings, it is the costliest and most pretentious structure of its kind in the Archipelago. The use of special precast trim for both the exterior and interior, and of a special surface treatment involving the placing of two separate classes of concrete for the walls of the structure, was very expensive and called for the utmost care in construction, but the results compare very favorably with the work of its kind in foreign countries.



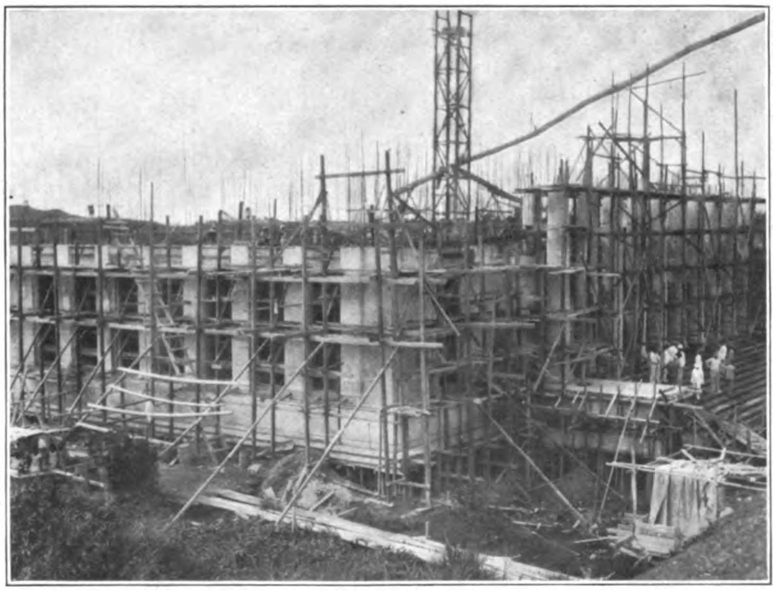
Interior view of Insane ward, San Lazaro Hospital, Manila.

This building is 55.0 meters long, by 18.4 meters wide, and is surrounded by a wide concrete terrace, with a massive concrete balustrade. By the use of specially prepared moulds, exceptionally good lines were obtained in constructing the massive exterior columns, and the bush-hammering treatment of the exposed surfaces brought out the natural color of the limestone aggregate of the exterior finish with beautiful effect. An idea of the magnitude of this project may be gained from the fact that over 8,000 barrels of cement, nearly 1,100,000 kilograms of reinforcing steel and nearly 5,000 cubic meters of crushed stone were used in the concrete work, while of the total of ₱370,000 expended in its construction, the labor cost was ₱108,000.



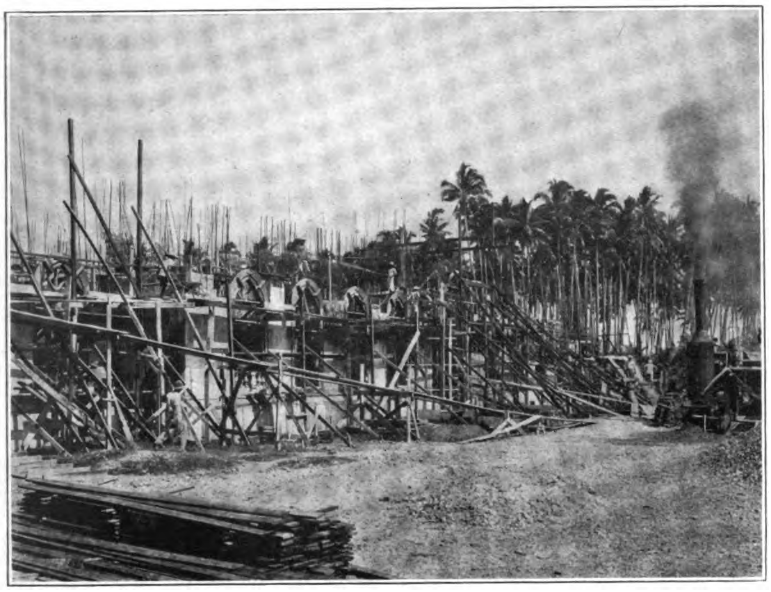
5510. Leyte Provincial Capitol, under construction, Tacloban, Leyte. April 21, 1919.

The construction of capitol buildings at Laoag, Ilocos Norte, and Tacloban, Leyte, was continued during the year. These buildings, while not so pretentious as the Pangasinan capitol, call for similar care in their construction and the use of special ornamental features.



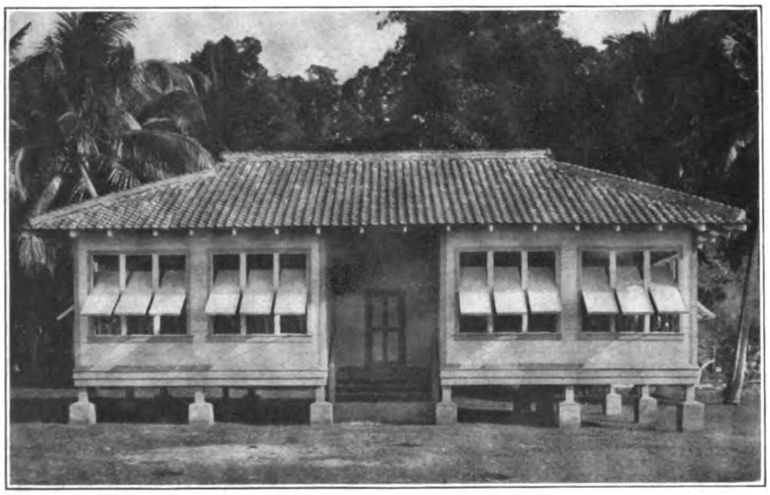
5515. Leyte Provincial Capitol, under construction, Leyte. April 21, 1919.

At Zamboanga, a Normal School building and an additional wing for the hospital were under construction at the close of the year. The former is of the standard type and is estimated to cost about ₱200,000, while the latter is similar in design to the main building of which it is an adjunct.



Zamboanga Normal School under construction, Zamboanga.

The usual school and market building work was executed, the number of completed structures of this class being only one less than the total for the preceding year, in spite of the necessity for meeting the greatly increased cost of materials, and lack of construction supplies in the local market.



No. (1) Semi-permanent two-room school building at Tuluyan, Sulu Province. This is a timber structure with Clay Tile roof and was constructed by contract in 33 days from the time the material was landed on the ground. Total cost was ₱4,068.60.

In general, building construction was seriously handicapped throughout the year by a lack of materials and transportation facilities.

DESIGNING DIVISION.

C. E. Gordon, *Chief Designing Engineer.*
E. C. Earle, *Acting Chief Designing Engineer.*

The continuance of the world war, has this year, as last, permitted of but small choice of building materials. The Designing Division, in consequence, has been compelled, in many instances, on account of the extreme high prices, to resort to last year's practice of preparing plans for structures with a view to their temporary construction, or to their construction of semi-permanent materials. Structures such as small buildings, bridges, piers, etc., which in normal times would have been constructed of concrete or of steel, have, in many cases during the year, been constructed of adobe stone and timber. The only alternative lying, in these instances is indefinite postponement of the construction contemplated, on account of high prices.

As a result of the call to war of reserve engineer officers, in the early part of this year, the Designing Division suffered a severe loss, its designing personnel being almost entirely taken, leaving but three designers and two electrical engineers in addition to the Acting Chief, to cope with the numerous projects that this Division is regularly called upon to handle.

5551. Cagayan Ferry, Misamis. April 21, 1919.

Despite the great loss of personnel, however, a fair amount of work has been accomplished, and it has been possible, though only with the greatest of effort, for the Division to meet the demands for designs of structures, the installation of plants, etc., which were positively essential. Numerous investigations have been instituted, studies made, estimates, specifications and plans furnished, for bridges, buildings, pumping and power plants, light plants, etc. In addition, a number of foreshore lease cases have been investigated and reported upon.

In the annual report for 1916, it will be noted that mention was made of a successful overflow type of concrete bridge, and in the annual report for 1917, it will also be noted that further mention was made of substituting timber spans for the ordinary low water opening, in the overflow type of bridge where the timber collapsible bridge had formerly been preferred. During the past year, designs have been made for a fixed deck overflow timber bridge, which has proven quite successful, and possesses advantages over both of the other two types, in that it can be placed at an elevation considerably lower than the ordinary span heretofore used, without suffering displacement, and unlike the collapsible bridges, does not have to be replaced after floods.

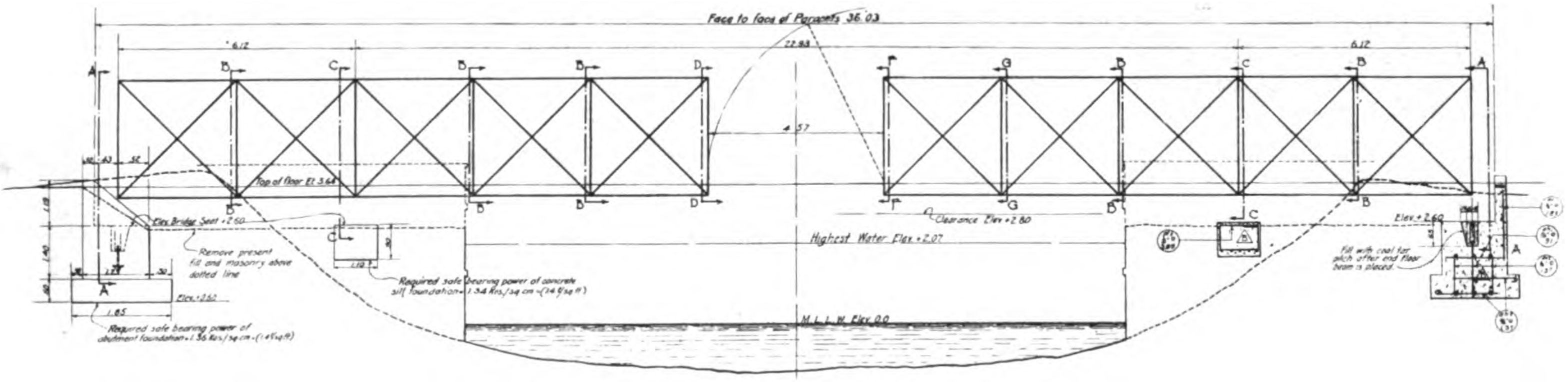
Plans were prepared during the year for the engine and boiler rooms, Cold Storage Building, Manila; Loay beacons, Bohol; Dauis lift bridge, Bohol; Catarman River hurdles, Samar; Overton pier, Overton, Lanao; Timber deck and substructure, Cebu wharf, Cebu; Baybay sea wall, Leyte; two septic tanks, of 5,000 gallons and 200,000 gallons capacity, respectively; Parañaque reinforced concrete girder bridge, Rizal; Auto truck bodies; Overflow standard timber trestles; Standard timber Howe truss spans; Collapsible bridges; Muelle San Francisco wharf wall; Macampon river bridge, Laguna; Lagnas river

5518. Calapan concrete wharf, Mindoro. April 17, 1919.

bridge; Dumaguete pier and sea wall (preliminary plans) Dumaguete, Oriental Negros; Catbalogan cause-way, Catbalogan, Samar; San Matias river bridge, Abra; Imbang river bridge, Occidental Negros; Iguig river bridge, Cagayan; Bank protection San Cristobal river, Laguna; Manikahan river bridge, Zamboanga; Camanug Creek bridge, Occidental Negros; Verde Creek bridge, Capiz; Sariaya river bridge, Tayabas; Zapote river bridge, Cavite; Bunsuran river bridge, Bulacan; and also plans for numerous miscellaneous structures.

Standing foremost among the designs above enumerated, are the designs for the Dauis bridge, Zapote bridge, Overton pier, Cebu wharf, Dumaguete pier, Parañaque bridge, and the septic tanks.

The necessity having arisen to bridge the narrow straight separating the towns of Tagbilaran and Dauis (Tagbilaran on the Island of Bohol and Dauis on the Island of Panglao), the question of providing a movable span to permit the passage of sailing craft, presented itself. As the price of steel prevented its consideration as a building material for this structure, it was necessary to work out designs in timber. A unique scheme was conceived for providing the required opening by throwing two timber cantilever spans out from each bank and completing the connection by a hinged counterweighted lift section. The lift section is provided with a hand power windlass and the span can be opened at any time by the *two* attendants.


Face to face of Parapets 36.03
6.12
6.12
22.93
4.57
Top of floor El 3.64
Elev. Bridge Seat +2.60
Remove present fill and masonry above dotted line
Elev.+2.60
1.85
Required safe bearing power of abutment foundation = 1.36 Kos./sq. cm.
Required safe bearing power of concrete sill foundation = 1.34 Kos./sq cm
Clearance Elev.+2.80
Highest Water Elev.+2.07
M.L.L.W. Elev. 0.0
Elev.+2.60
Fill with coal tar pitch after end floor beam is placed
A
B
C
D
F
G

The Zapote River bridge is a 30-meter reinforced concrete arch span of the open spandrel type, and has a rise of 5 meters at the crown. The balustrade is of exceptional design and lends grace to the structure.

The Overton pier is a timber structure, 131 meters long, and is founded on treated timber piles.

The Cebu wharf, as provided for in the revised plans, will have a timber deck and will be supported on treated timber piles which are encased in concrete, except for the rear supports, or piers which are now in place and are of reinforced concrete.

Preliminary plans only, have been prepared for the Dumaguete pier. This pier will be of the solid fill type, and will be constructed of two semi-gravity concrete walls, founded on timber piles. The walls will be tied together at intervals by reinforced concrete beam ties and the area between walls will be filled with stone and dredged material. Plans for the causeway connecting the pier with the shore have also been completed.

Designs for the Parañaque bridge provide for a structure, the general appearance of which, will be about the same as the Navotas bridge, the latter connecting the towns of Malabon and Navotas. It will be a reinforced concrete structure of the girder type.

The septic tank designs are, in general, of the Imhoff type, and are calculated to serve the needs of schools and small towns.

In the Mechanical and Electrical section, considerable progress has been made. Plans and specifications, bills of materials and estimates for light systems, telephone installations and call bell service, for 12 government buildings have been prepared. Specifications were completed for the Zamboanga hydro-electric plant. Quotations were obtained and requisitions placed for the outside line materials and generating station equipment. A study was made of the "hydraulic jump" method of disposing of the overflow of waters from this plant.

Investigations and studies were also made for a proposed hydro-electric development of the Calaraya river, and recommendations pertaining to this project were forwarded to the Governor-General. Hydro-electric schemes for the towns of Mambajao, Misamis, and Duero, Bohol, were also investigated.

Specifications were prepared and quotation requested, relative to the installation of a 60 Horsepower crude oil engine for the Taal plant.

Plans were partially prepared for the Bontoc and Cotabato plants.

Plans, estimates, etc., relative to the San Jose, Antique, Pagsanjan, Laguna, Batangas, Batangas, and Carcar, Cebu, plants were made.

Extended tests were conducted on a compounded alcoholic motor vehicle fuel, with a view to determining its value as a substitute for gasoline. Tests were also made and reports rendered on a kerosene carburetor for use on automobile engines.

The machinery and the hull of the Dredge "America" laying at Cebu was inspected and studied, with a view to reconstruction.

Specifications and requisitions were prepared for an electric shovel and generating equipment for the Los Baños Quarry, Los Baños, Laguna. Plans have been developed for tram lines and the operation of the plant entirely by gravity in connection with one elevator-incline.

Recommendations, requisitions, etc., were prepared for three provincial telephone systems, to be installed in the Province of Zambales.

The new cement gun and sandblast equipment was assembled and has been successfully used in the repair of concrete bridges at various points. An operating crew was recruited and trained for the operation and care of the apparatus, and are now engaged in work upon various structures thruout the Islands.

A considerable amount of work of a consulting nature was performed and general investigations made, covering the machinery and equipment of the Philippine American Oil Company, Philippine Refining Company, Copra Products Company, Santa Ana Oil Mills Company, Inc., Rizal Refining Company, Oil Manufacturing Company, and The Cristobal Oil Company. A report was prepared and submitted on methods of coconut oil manufacture, together with an outline of the machinery required, and other information necessary to the establishment of a coconut mill.

A rough estimate was also made of the amount of water power available and amount developed in the Philippine Islands.

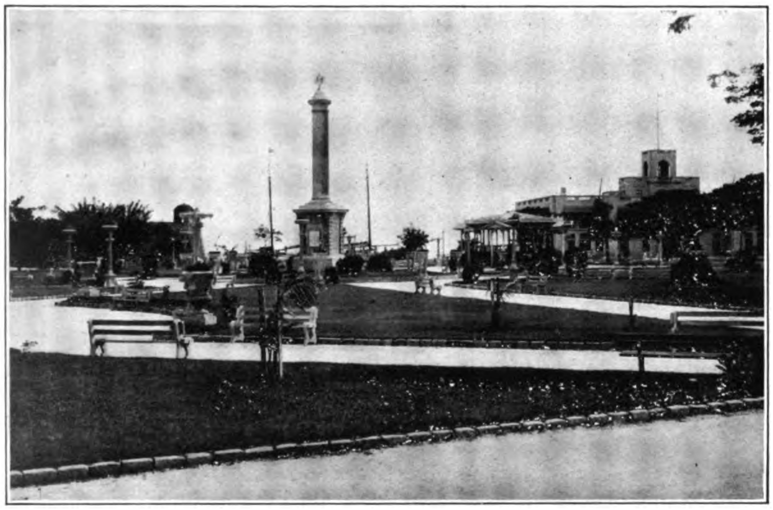
DIVISION OF ARCHITECTURE.

JUAN M. ARELLANO, Supervising Architect. TOMAS MAPUA, Supervising Architect.

REPORT OF MR. ARELLANO.

The report submitted herewith embraces the period from the time Mr. Ralph Harrington Doane, Consulting Architect of this Bureau left the service until the end of the year 1918, or the period covered by the last semester of last year.

Lucid, just and well-thought are the arguments advanced by Mr. Doane in his report for the fiscal year 1917, wherein he appeals for a dignified and high standard policy of architecture in public buildings calculated to promote a healthy civic pride in the people of the Philippines. This policy is the effect of the reaction of that period of severe and undecorated architecture implanted by Mr. Parsons, who, in order to meet the then pressing needs of the Government dotted the city of Manila with bare concrete buildings devoid of all ornamental traces of legitimate architecture.



Cebu plaza, showing the Magallanes Monument in the foreground, Cebu.

The above-mentioned report has, however, an untoward tendency to favor the erection of splendid and elaborate buildings, a policy which should be carefully considered and studied by those officials performing the duties of Consulting Architect of the Philippine Government because to go to the extremes in ornamentation will be productive of unbecoming results nowadays. Mr. Doane had seen from the various reports of the Auditor that the coffers of the Insular Treasury are being filled with millions of pesos, but inasmuch as the prosperity evident on every hand is only due to abnormal conditions caused by the war which in some way or another has benefited these Islands, we should limit these expenditures commensurate with the many other existing and urgent needs of the people which require the attention of Government officials in the proper investment of public funds as for example, the extension of the irrigation systems and the development of agriculture and of our rich natural resources.

It is reasonable and commendable that the construction of public buildings which the Government is at present either undertaking or contemplating, such as the Legislative Building, the Manila Post Office, the Manila City Hall, the Supreme Court Building and the Capitol Buildings of first class provinces, be constructed of ample and magnificent ornamentation which will not only heighten their estimation, but at the same time will also tend to dignify and ennoble the purpose of these edifices. The writer, however, does not find sufficient reasons to justify the excessive ornamentation found in some buildings devoted wholly or partially to official use and in some executive buildings of those provinces which do not command sufficient resources to defray and meet the necessary expenses to be incurred in a pretentious structure.

25052. Wright Park Pagoda, Baguio, Benguet.

Architecture is one of the major fine arts, wide in its appeal, and universally accepted as demonstrative of the character and temperament of the people, and expressive of its degree of civilization and culture, that it is certainly most pleasant and gratifying to observe the stand taken by both private individuals and official entities for the prevalent widespread and general interest in architecture. The most promising result of this general interest is the extensive development of the rich natural resources of the land which, to quote Mr. Doane, "may be marshalled in the production of an architecture sufficient in quantity and quality to announce to posterity the genius and artistic accomplishments of the present day." It is hoped therefore that the development of the talents of the country and widespread utilization of the native building materials found in abundance everywhere will contribute and prove an effective remedy towards solving the problems of architectural construction which at present confront the Philippines.

PROJECTS ASSIGNED FOR STUDY.

1. *Contagious Disease Ward, San Lazaro, Manila.*—The Work is well advanced and construction is being commenced on the second floor. The roof trusses are being put in place.
2. *Insane Ward, San Lazaro, Manila.*—All work completed except the ornamental cornice, the grading of the road, and the parking that will surround same.
3. *Teacher's Monument, Cementerio del Norte, Manila.*—All ornamental stone works completed with the exception of some bronze ornaments which cannot be placed for lack of funds.
4. *Insular Capitol Building, Manila.*—The piling and foundations have been contracted. Some piles are already driven, but works has been suspended on account of a possible change in its location.
5. *Post Office Building, Manila.*—Soil tests are being made and the plans will be completed about the middle of March, 1919. Bids for the piling will be opened February 15, 1919.
6. *Burnham Memorial, Manila.*—All bronze and synthetic stone ornamental works have been awarded and will be fully completed in about six months.
7. *Two-Story Building for the Vaults of the Bureau of Forestry, Manila.*—Work already awarded and is now under construction.
8. *Entrance Gate, Contagious Disease Hospital, Manila.*—Plans completed and advertised for bids.
9. *Veterinary Research Laboratory, Pandacan, Manila.*—Plans completed and work advertised for construction.
10. *Leyte Capitol Building, Tacloban, Leyte.*—The appropriation for this building is about ₱295,000 and the expenditures now amount to ₱270,000. The building is 50 per cent complete.
11. *Zamboanga Normal School, Zamboanga, Mindanao.*—Total appropriated for construction of ₱200,000 and the expenditures now amount to ₱151,000. The building is about three fourths completed.

12. *Daet Presidencia, Ambos Camarines.*—The building is complete with a total cost of about ₱37,000.

13. *Jones Bridge, Manila.*—The work on the foundations for the central arches is finished. The plans are complete with the exception of the Magallanes Drive approach which is now under consideration due to possible change in the original plans.

14. *Changes in the Burnham Plans, District of Pandacan, Manila.*—Proposed changes have been recommended and submitted for approval. (See comment bellow.)

15. *Rizal Hall Laboratory, Philippine University, Manila.*—Plans are already complete and soil tests have been ordered.

16. *Veterinary Science College Building, Philippine University, Manila.*—Plans completed and is ready for construction.

17. *Additions to the Tarlac Provincial Jail, Tarlac.*—Plans and specifications have been prepared and are complete.

18. *Zambales Provincial Building, Zambales.*—Plans are still under preparation.

19. *Philippine National Bank, Manila.*—Preliminary drawings are being prepared for approval of the President.

20. *Waiting Station, Philippine University, Manila.*—Plans and specifications have been prepared and submitted to the President of the University.

21. *Pola Presidencia, Mindoro.*—Plans submitted by the district engineer have been approved for construction with certain modifications.

22. *Bato Presidencia, Leyte.*—Plans have been furnished to construct a ₱4,000 building.

23. *Sariaya Rizal Park, Tayabas.*—The plans which were submitted to this office have been approved.

24. *Manito Presidencia, Albay.*—Plans were furnished to construct a building at a cost of ₱3,000.

25. *San Pedro Tunasan Presidencia, Laguna.*—Plans to construct a ₱6,000 building have been furnished.

26. *Branch Office Philippine National Bank, Iloilo.*—Preliminary plans are being prepared following the general outline of sketches submitted.

27. *Ilocos Sur Provincial Building, (Vigan).*—Preliminary plans have been submitted to the Provincial Board for approval. The preparation of the working plans has been suspended on account of lack of personnel.

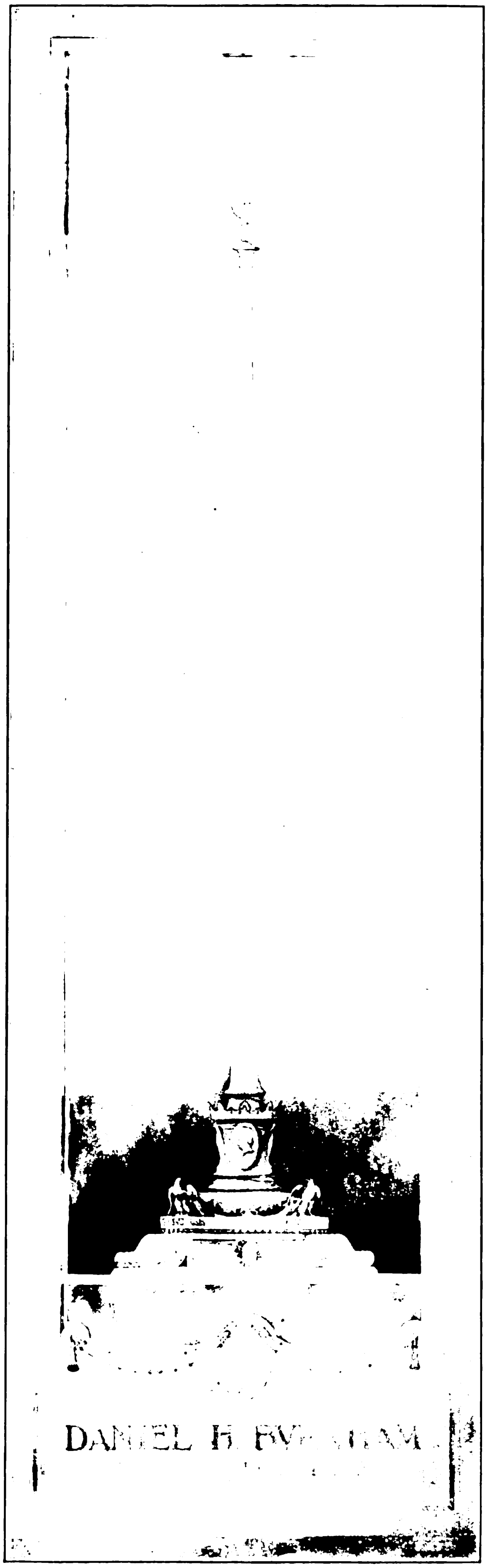
28. *Goa Presidencia, Ambos Camarines.*—Plans were approved to construct a ₱10,000 building.

29. *Iloilo High School and Auditorium, Iloilo.*—Plans are underway for a building to cost approximately ₱150,000.

30. *Mabini School Inscription, Batangas.*—Plans have been prepared and submitted to the Director of Education for his approval.

The policy adapted by the writer in the design of small and unimportant new buildings over existing old structures, has been to utilize every good and sound material found in them and endeavor at all times to secure homogeneity in the use of the materials in order to obtain the greatest beauty and economy and in order also to reduce to a minimum the loss of time of construction satisfying thereby the growing demands of the public. Several examples of this nature are the Veterinary Science College Building of the Philippine University, the Municipal Buildings of San Jose, Batangas and San Pedro Tunasan, Laguna, the Majayjay market in Laguna, and the provincial building at Vigan, Ilocos Sur.

There are many public buildings about the provinces which are nearing the limit of usefulness caused by the ravages of time, which, however, have acquired a very local savor and have been hallowed by age, that Nature and the weathering of time have made these buildings an integral part of the soil and landscape wherein they are located. The best solution to the various aspects of these problems is the adoption of a picturesque and attractive style in architecture such as were prevalent during the XVI century of Spanish and Italian renaissance which may be either combined or amalgamated with those details typical of the country and location. With a little study of every individual case and with the application of an architectural landscape to the surroundings we will be able to attain a



very satisfactory solution of preserving for these buildings their epoch making function and so with a very little additional expense we will serve the needs of the public for buildings of an original, beautiful and desirable type.

The authorities of the city of Manila have been requested by the land-owners of the greatest portion of Pandacan to abandon the construction of certain streets crossing the center of the district as proposed in the Burnham plans. These requests have been submitted to the Division of Architecture for study and recommendation as provided by law. After the necessary investigation on the site and hearing the reasons advanced by all parties concerned, it has been found that a great majority of the proposed streets have lost, not only for the present time, but for the future, all reasons for the necessity of their construction inasmuch as this district, as recent developments demonstrate, has been preferred by the growing and expanding industries being established in Manila on account of the water facilities and easy transportation which Pandacan offers to commerce and not as Mr. Burnham had thought, that Pandacan would be converted into a residential district. The owners of the great parcels of lands reasonably object to having their properties crossed and divided by streets which will naturally reduce the available space that may be devoted to commercial activities and would disentigrate the unity of their organization.

A careful study has been made of all the facts pertinent to this problem and of the entire district of Pandacan and the most feasible and equitable courses recommended are: (*a*) to widen the Jesus and Beata streets; (*b*) to forego the construction of a large number of streets proposed in the Burnham plans; and, (*c*) to build several necessary parks in order to reserve the greatest open space and secure a place for the comfort and invigoration of the growing number of working people, and who will in the very near future reside there when more factories will have been established. Efforts are being made and it has been so recommended to the authorities concerned to save the Beata creek from the proposition to fill up same on account of its very high sentimental and historical value to Filipino folklore and literature.

The shortage of experienced artisans and craftsmen in the execution of different ornamental works pertaining to the numerous and important projects entrusted to the Division of Architecture marks the Rubicon of the development of architecture in the Philippine Islands. Many of the interior ornamental works required by this office demand fabrication in carved wood which will necessitate individual care and attention at every step of production with a consequent increased cost and loss of time which is of vital consideration. Wood carving of a very fine technique was splendidly done in these Islands in times past, but it is to be regretted that most of the best carvers and sculptors have passed away without imparting their skill and craft in this art. The very limited number of artisans and sculptors available demand very high wages with a result that the cost of producing ornamental architectural works is excessively high, and it certainly is expensive to continually require the production of all these ornaments for public buildings. It is suggested as a remedy to the great obstacle in the promotion of architecture that all interior ornamental works be produced and performed on a mechanical basis using plaster stucco for the interior finish of all public buildings. The component parts of plaster stucco are found in large quantities all over the islands, but before attempting to accomplish the work above suggested it is imperative that the services of an expert in plaster in the allied arts be first secured,—a man well acquainted with its complicated composition and dexterous in its handling. His services would prove very valuable in completing not only all the works now at hand at a great saving in cost and time, but he would also be required to be a teacher of his trade, thus imparting his knowledge and craftsmanship to the native masons.

The same obstacles as above are encountered in all the ornamental bronze and metal works which the government is constantly obliged to secure for the building projects undergoing construction. There are at present fairly good modelers to make the working models in a very creditable manner, but which upon being turned over to foundry contractors produce unsatisfactory ornaments which lose about half of the designed details on account of the lack of proper knowledge of foundry skill. It is therefore recommended that either the teaching force of the School of Arts and Trades or the personnel of this Bureau be augmented by the addition of an expert foundryman who is capable of imparting to the Filipino his knowledge, experience and training in the modern processes now used in this industrial art. This acquired knowledge will be an incentive to metal working and encourage its production on a large scale, thereby reducing the high cost of bronze and metal ornamental works. The adoption of the measures suggested above would signify the acquisition of a system of fostering the native talent and skill which now lies dormant.

The number of architects who have studied at home and abroad is very limited and the available office personnel is so small that it is unable to attend to all the projects entrusted to the Bureau. If it is considered that the architectural program of the Philippine Legislature is increasing every year to a very enormous proportion and if it is desired that the Division of Architecture be able to cope and handle all the work of construction deemed necessary for the expanding commerce of the country, it is of absolute necessity that the responsible officials take at a very early date the desired steps toward sending to American and European Universities students to take up under-graduate and post-graduate courses in architecture, and students to specialize in sculpture and decorative painting.

REPORT OF MR. MAPUA.

The annual report for the year 1918 shows a tendency toward embellishment and color in public edifices. This new architectural policy has been made possible by increased appropriations over previous years and by increased interest in the construction of dignified government edifices.

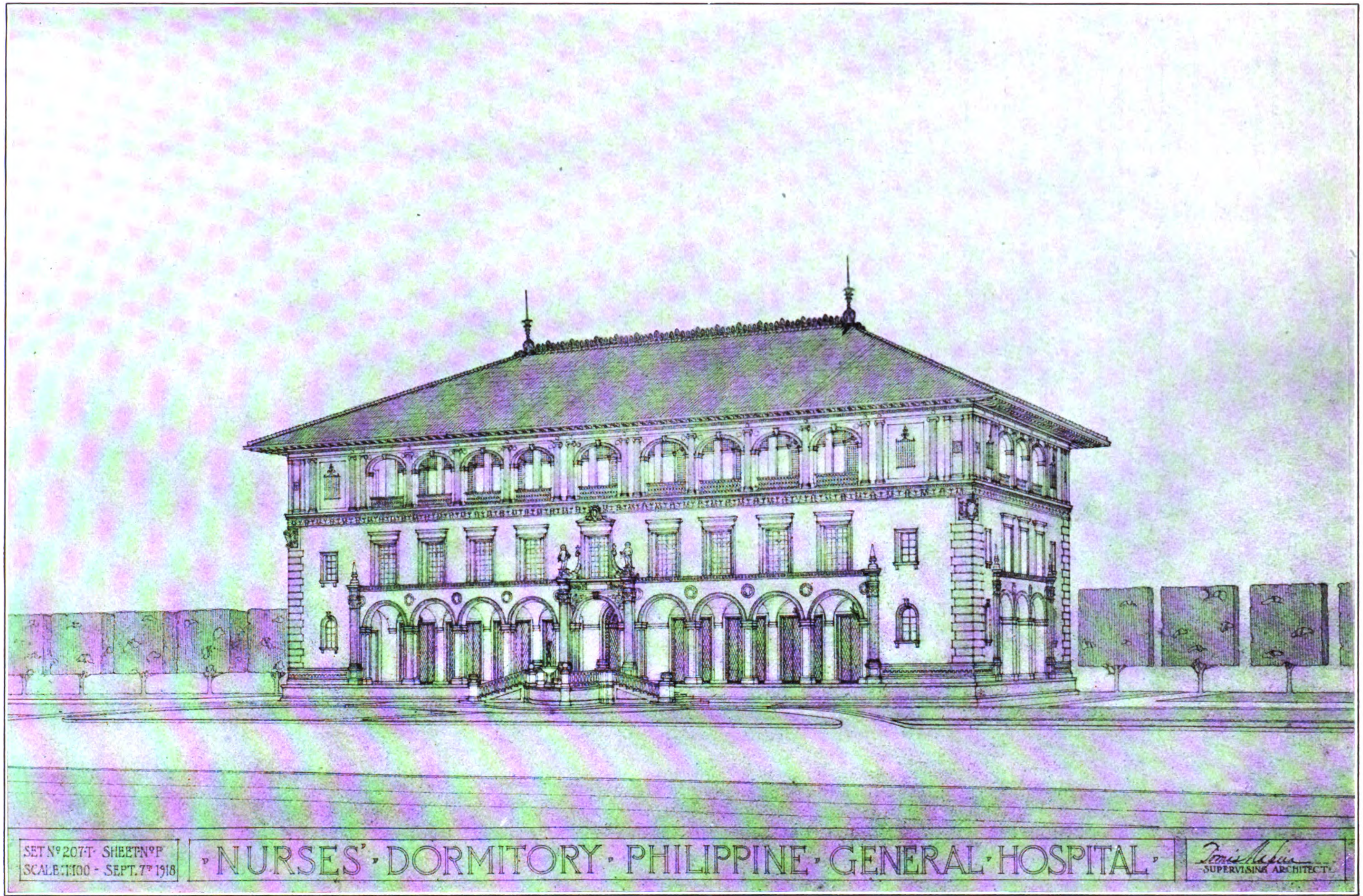
The following considerations (taken from Mr. R. H. Doane's article published in the Bureau of Public Works Quarterly Bulletin of July 1, 1918) have led to the inauguration of this new architectural policy in the Philippine Islands, viz: "Concrete for the exterior of monumental building projects is admitted by the architectural profession to be the least desirable of all masonry materials. Its natural color is gray and lacking in vibrant quality and, while the natural effect of time upon accepted building stones produces a weathering beneficial to the tone quality, the effect of weathering upon concrete is decidedly detrimental, and results in a more unsightly and depressing aspect than is presented by the newly constructed material."

In view of the fact that it is impossible at the present time to secure genuine ashler stone for the exterior of buildings, an artificial stone very commonly used in large cities of the United States, France and Italy for decorating the facades of buildings has lately been introduced in these Islands and is composed of granulated particles of handsome local marbles mixed with cement in such proportions as to make the particles of marble completely preponderant. The surface of this composition is tooled to expose the marble aggregate, thus producing a vibrant color tone by virtue of the exposed particles of marble.

The application of synthetic artificial stone (as this composition is generally known) to the exterior of the buildings gives brillancy and produces pleasurable color sensations. It is a practical solution of topical climatic conditions and it represents substantial architectural beauty.

Government buildings have already been practically completed with this new composition. They have aroused a great deal of interest, and the people in the communities where they are located seem to be exceedingly pleased with this new production of art.

We are on the threshold of an architectural era of great importance in the history. There has never been such a strong desire for imposing, artistic and monumental buildings as now prevails here. Aside altogether from a very large number of standard schoolhouses, markets and slaughterhouses the following bonafide projects are either actually under way, or for which appropriations have definitely been made, a conservative estimated cost of which is approximately ten million pesos:


SET Nº 207-T- SHEET Nº P
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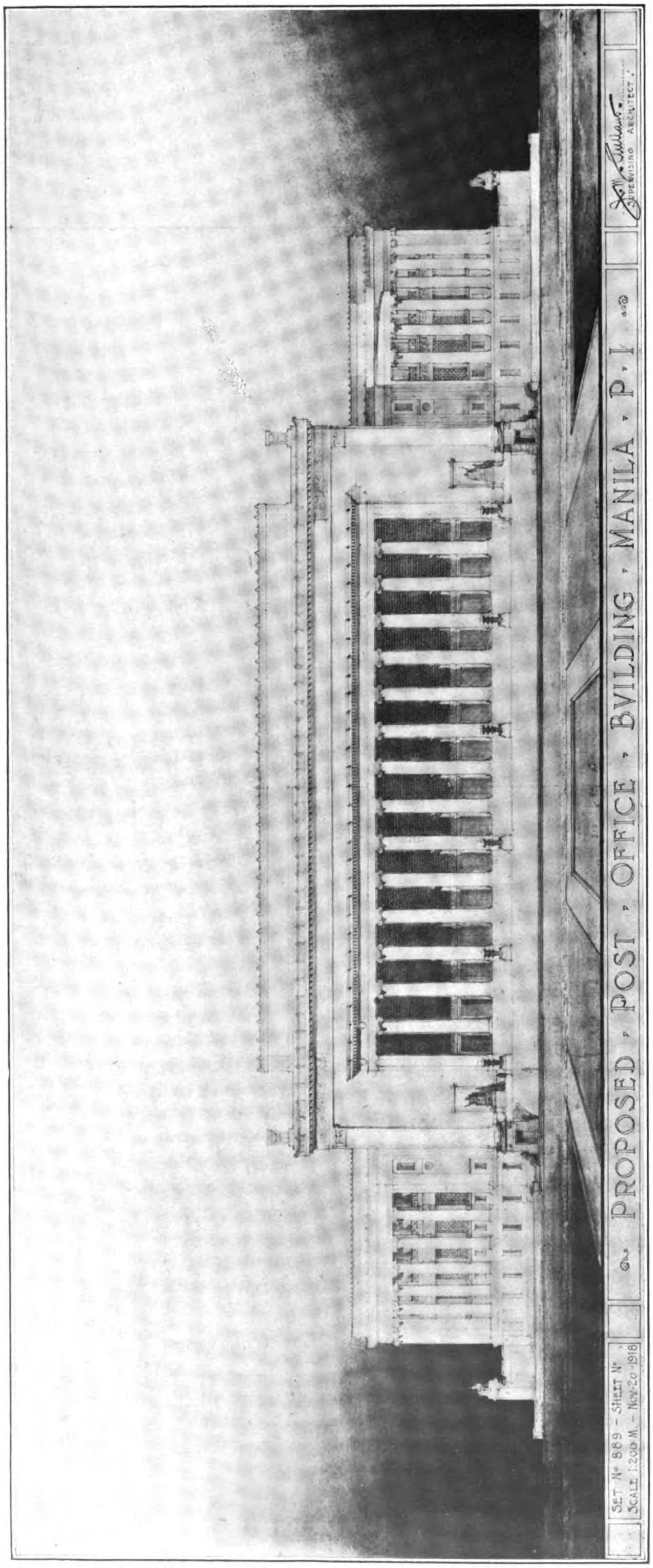
NURSES' DORMITORY · PHILIPPINE · GENERAL · HOSPITAL
SUPERVISING ARCHITECT


PROPOSED · POST · OFFICE · BUILDING · MANILA · P. I.
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Manila projects.

Wharf building.
Malacañang Executive.
Malacañang repairs.
Academic Building, School of Arts and Trades.
Manila High School.
Arranque market, Manila.
Changes Burnham plans, Sta. Ana.
O'Donnell school.
Manila custom house.
Nurses' Home, Philippine General Hospital.

Provincial projects.

Pangasinan capitol building.
Lawag provincial building.
Burawen presidencia.
Sibonga presidencia.
Alangalang presidencia.
Zamboanga General Hospital.
Bodegas, Philippine National Bank.
Constabulary Barracks.
Palo presidencia.
Zamboanga tiendas.
Cebu Normal School.
Lawag Normal School.
Batangas water works.

The present extensive architectural program demands for efficient architectural designers and a high-class architectural organization. The Division of Architecture at the present time has forty-three employees, all of whom are engaged in office work. The necessary structural inspection in connection with building projects in the provinces is usually done by the respective district engineers.

The following paragraph from Mr. Doane's article above referred to is worthy of note: "Filipinos are naturally most expert draftsmen. The ability to draw is remarkably prevalent among the Filipino people and the standard of draftsmanship in the Government architect's office is not surpassed by that of any architectural organization elsewhere. It is regretted that there are not a sufficient number of educated Filipino architectural designers available to produce the architectural designs required for public works. Only five filipino architects have been educated in Europe and in the United States and at the present time there are no Filipino students abroad pursuing architectural studies. Unless immediate steps are taken to interest young men in this profession, and unless immediate steps are taken by the Government to educate abroad talented young men in the fine art of architecture, it will be impossible to cope with the constantly expanding architectural program of the Government. There are so many urgently needed specific building projects that it is impossible to give such attention as is advisable and necessary to city planning problems throughout the Archipelago, and furthermore it is impossible with the limited supply of architects available to properly study in advanced the larger architectural composition of which the first units are now being erected."

The supervising architect is by law required to approve all Government buildings, Insular, provincial, and municipal, whether large or small, throughout the Archipelago. This brings to his office a tremendous volume of work covering a wide range of important and unimportant projects. At the present time numerous small town projects are necessarily abandoned to the mercy of local "maestros de obras," or local contractors, for want of efficient designers in the architectural division to properly attend them.

The system of standardizing public buildings is therefore necessarily the only policy under present economic conditions. For every schoolhouse that is designed there is the demand for the simultaneous construction of several others: and the same case occurs with market buildings, municipal buildings, provincial buildings, etc. Standardization is therefore the only practical solution under these conditions. But it is hoped that as the Division of Architecture grows and becomes able to properly handle the work of designing all public buildings, the tendency toward standardization will be abandoned.

IRRIGATION DIVISION.

A. D. WILLIAMS, Chief.
G. G. STROEBE, Designing Engineer.

The Irrigation Division was reorganized in June, 1918 with Mr. A. D. Williams as chief, and Mr. G. G. Stroebe as designing engineer. In July, Mr. Williams left to enter the United States military service, and at about the same time Mr. Stroebe became colonel of the engineer's regiment in the Philippine National Guard. The work of the division during the remainder of the year was greatly handicapped by the absence of these men and by the lack of technical personnel to fill the positions provided.

The irrigation activities of the Bureau of Public Works during the past year have been confined largely to the maintenance of irrigation systems constructed by the Government, the repair and improvement of irrigation systems in the Friar Lands Estates and the surveys and preliminary field investigations of new irrigation projects. Six field parties have been and are employed on topographic surveys for irrigation projects as follows:

San José project, Province of Nueva Ecija.
Laoag-Vintar project, Province of Ilocos Norte.
Botolan project, Province of Zambales.
Naic project, Province of Cavite.
San Mateo project, Province of Rizal.
Bulo River project, Province of Bulacan.

The area of land to be irrigated by these projects is approximately 23,000 hectares. In addition to the above surveys which have been conducted under the supervision of the Central Office, the following irrigation projects have been investigated by the district engineer:

Tagudin project, Subprovince of Amburayan.
Mainit project, Subprovince of Bontoc.
Trinidad project, Subprovince of Benguet.
Dipolog project, Province of Zamboanga.
Santa Maria project, Province of Zamboanga.
Mercedes project, Province of Zamboanga.
Ayala project, Province of Zamboanga.

In the department of water rights determination during the year 1918, there were 132 applications for water rights and 123 statements of existing water rights filed.

The Taguan River irrigation system in Tayabas Province has been adjudicated and certificates issued.

Surveys and field investigations have been accomplished on the following established irrigation systems:

Pansol Creek, Province of Bataan.
Talisay River, Province of Bataan.
Nayom River, Provinces of Zambales and Pangasinan.
Sierra Bullones River, Province of Bohol.
Bued River, Provinces of Pangasinan and La Union.

In addition to the above, there are six systems the surveys of which were completed prior to 1918 but for which the priority has not yet been determined.

The surveys and field investigation of the following established irrigation systems will be made as soon as personnel is available:

Parasapas Creek, Province of Pangasinan.
Nagsincaoan River, Province of Ilocos Sur.
Ubbog Estero, Province of Ilocos Sur.
Maitim River, Province of Laguna.
Ange River, Province of Pampanga.
Nasisi River, Province of Albay.
Ynarihan River, Province of Camarines.
Gugo Estero, Province of Tarlac.
Buge Estero, Province of Tarlac.

The area of land directly affected by the above systems is approximately 10,000 hectares with an approximate value of ₱3,000,000.

Allotments aggregating ₱378,558 were made during the year on 34 municipal water supply projects, this representing two-thirds of the estimated cost of the systems, the remaining one-third being provided by the municipalities concerned. Owing to the shortage of pipe, comparatively little actual construction was undertaken but the purchase of the cast iron pipe for the Lucena-Tayabas water works was consummated in March and in November orders were placed through the Insular Purchasing Agent for galvanized pipe and fittings to the value of about ₱500,000, for delivery during the first half of 1919. These stocks are estimated to be sufficient for the construction contemplated for 1919 in addition to the projects mentioned above.

The following systems were under construction or completed at the end of the year:

Barili, Cebu.
Batangas, Batangas.
Pagsanjan, Laguna.
San Jose, Antique.
Lucena, Tayabas.
Tayabas, Tayabas.
Naga, Cebu.
Pilar, Cebu.
Jolo, Sulu.
Dauis, Bohol.
Cuenca, Batangas.

Investigations and preliminary studies were made of water supply systems for the following municipalities:

Bangued, Abra.
Lucban, Tayabas.
Cabanatuan, Nueva Ecija.
Davao, Davao.
San Antonio, Zambales.
Dansalan Keithley, Lanao.
San Manuel, Pangasinan.
Abra de Ilog, Mindoro.
Pototan, Iloilo.
Majayjay, Laguna.
Gasan, Marinduque.
Loon, Bohol.
Tacloban, Leyte.
Laoag, Ilocos Norte.
Indang, Cavite.
Garcia Hernandez, Bohol.
Antequera, Bohol.
Baybay, Leyte.

The hydrographic investigations which were discontinued in 1913 have been resumed and gaging stations have already been established on 37 streams, nearly all in connection with proposed irrigation projects. In addition to these 33 stations are being operated by the district engineer from funds provided by the provinces.

CONVERSION TABLE.

One peso (₱) = 50 cents, United States currency.
One kilometer (km.) = 0.62 miles.
One kilogram (kg.) = 2.20 pounds (lbs.).
One centimeter (cm.) = 0.39 inches.
One meter (m) = 3.28 feet.
One hectare = 2.47 acres.
One cubic meter (cu. m.) = 1.31 cubic yards.
One hectare meter per day = 8.107 acre feet per day.
One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) second feet.

FINANCIAL.

(Loans for roads, bridges, schools, markets, municipal, and provincial buildings, waterworks, etc., from October 1, 1918, to December 31, 1918.

Provinces and projects.	Act. Nos.		Total.
	1729.	1749.	
Ambos Camarines:			
Tigaon market	--------	₱18,000	₱18,000
Bohol:			
Tagbilaran market	--------	18,000	18,000
La Union:			
Agoo market	₱15,000	--------	15,000
Pangasinan:			
Provincial building	--------	40,000	40,000
Rizal:			
Maango bridge	--------	25,000	25,000
Marikina market	--------	16,000	16,000
Samar:			
Bugko bridge	45,000	--------	45,000
Total	60,000	117,000	177,000

AMBOS CAMARINES.—For the purpose of purchasing a site and erecting a modern market building thereon, a loan of ₱18,000 is hereby granted the municipality of Tigaon, Province of Ambos Camarines, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

BOHOL.—For the purpose of purchasing a site and erecting a modern market building thereon, a loan of ₱18,000 is hereby granted the municipality of Tagbilaran, Province of Bohol, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

LA UNION.—For the purpose of purchasing a site and erecting a modern market building thereon, a loan of ₱15,000 is hereby granted the municipality of Agoo, Province of La Union, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

PANGASINAN.—For the purpose of completing the construction of a provincial building, a loan of ₱40,000 is hereby granted the Province of Pangasinan, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

RIZAL.—For the purpose of constructing the Maango bridge, a loan of ₱25,000 is hereby granted the Province of Rizal, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of purchasing a market site and erecting a modern market building threon, a loan of ₱16,000 is hereby granted the municipality of Mariquina, Province of Rizal, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

SAMAR.—For the purpose of constructing the Bugko bridge, a loan of ₱45,000 is hereby granted the Province of Samar, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

APPENDIX A.

CIRCULAR LETTERS ISSUED BY THE CONSTRUCTING DIVISION FROM OCTOBER 1, 1918, TO DECEMBER 31, 1918.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS

BUREAU OF PUBLIC WORKS

MANILA, P. I., *January 16, 1919.*

Constructing Division Memorandum No. 18.

SIR: During the past year the work of the Central Office has been seriously handicapped through failure to receive Director's Project Reports, Forms Nos. 181 and 182, promptly. District Engineers are directed to mail these reports promptly on the date specified on the back thereof, or to submit sufficient reasons for failure to do so. A statement on the back of these forms to the effect that their submittal was delayed by failure to receive the Provincial Treasurer's Trial Balance must be supported by notation as to the dates on which Forms Nos. 95-A and 98-A were delivered to the provincial treasurer.

C. E. GORDON,
Acting Director of Public Works.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
MR. R. H. TREASH AND
MR. JOSE DEL CASTILLO.

MANILA, P. I., *January 16, 1919.*

Constructin Division Memorandum No. 19.

SIR: It has been noted that many district engineers report delay in the receipt of the Provincial Treasurer's Trial Balance by their office. Attention is invited to the fact that the success of the system provided for in Provincial Division Circular No. 315 of the Bureau of Audits (Constructing Division Circular No. 144) depends largely upon the promptness with which each of the offices concerned executes the duties assigned them therein.

District engineers are directed to comply carefully with the provisions of paragraphs Nos. 18 and 20 of the circular above-mentioned, to the end that the work of the Treasurer's office shall not be delayed. Proper care in the preparation of pay rolls and vouchers and the prompt submittal of Forms Nos. 95-A and 98-A should obviate any cause for delay in closing the Road and Bridge Fund Accounts of the provincial treasurer within the time specified in Circular No. 315.

C. E. GORDON,
Acting Director of Public Works.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
MR. R. H. TREASH AND
MR. JOSE DEL CASTILLO.

MANILA, *January 27, 1919.*

Constructing Division Memorandum No. 20.

GOVERNMENT EMPLOYEES NOT TO ENGAGE IN POLITICAL ACTIVITIES.

SIR: Attention is invited to the subjoined Circular No. 73 of the Bureau of Civil Service, dated January 15, 1919, which adduces the existing law and regulations with respect to the indulgence by certain Government employees in political activities. District engineers will bring this circular to the individual attention of all employees under their charge. Severe action will follow any violation of the intent of this circular.

For the Director:

C. E. GORDON,
Chief of Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
CITY ENGINEER, BAGUIO,
MR. R. H. TREASH AND
MR. JOSE DEL CASTILLO.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
BUREAU OF CIVIL SERVICE.

[CIRCULAR NO. 73.]

MANILA, *January 15, 1919.*

To Chiefs of Bureaus and Offices:

I have the honor to invite attention to the following provisions of law and civil service rules touching political activities of persons in the Government service.

ADMINISTRATIVE CODE.

SEC. 449. *Persons prohibited from influencing elections.*—No judge of first instance, justice of the peace, or treasurer, fiscal, or assessor of any province and no officer or employee of the Philippine Constabulary or of the Bureau of Education shall aid any candidate or exert influence in any manner in any election or take part therein otherwise than by exercising the right to vote, under penalty of being deprived of his office and being disqualified to hold any public office whatever for a term of five years.

SEC. 687. *Contributions to political fund prohibited.*—No person in the Philippine civil service shall be under obligation to contribute to a political fund or to render any political service, nor shall he be removed or otherwise prejudiced for refusing to contribute or render any such service; and no officer or employee in the Philippine civil service shall directly or indirectly solicit, collect, or receive from any other officer or employee, any money or other valuable thing to be applied to the promotion of any political object whatever.

Any person violating any provision hereof shall be removed from office or dismissed from the service and shall be subject also to prosecution as provided by law.

SEC. 2673. *Solicitation of political contribution or political service.*—Any officer or employee in the Philippine civil service who shall directly or indirectly solicit, collect, or receive from any other officer or employee in such service any money or other valuable thing to be applied to the promotion of any political object or purpose or shall solicit or require him to render political service of any sort, and any officer who shall remove any officer or employee in such service or otherwise injuriously affect or prejudice him in his official position on account of his failure or refusal so to contribute or render political service, shall be punished by a fine not exceeding one thousand pesos or by imprisonment not exceeding six months, or both.

CIVIL SERVICE RULES.

SEC. 1, *Rule XIII.*—No person in the Philippine civil service shall use his official authority or official influence to coerce the political action of any other person or body.

SEC. 6, *Rule XIII.*—* * * pernicious political activity, offensive political partisanship or conduct prejudicial to the best interest of the service * * * may be considered reasons demanding proceedings to remove for cause, to reduce in class or grade, or to inflict other punishment as provided by law in the discretion of the Governor-General or proper head of Department. No Chief of a Bureau or Office shall knowingly continue in the public service any subordinate officer or employee who is inefficient or who is guilty of any of the above-named derelictions, without submitting the facts through the Director of Civil Service to the Governor-General or proper head of Department.

SEC. 8, *Rule XIII.*—No person in the Philippine civil service, classified or unclassified, permanent or temporary, shall take any active part in political management or in political campaigns: *Provided,* That this section shall not apply to elective officers, officers and employees of either House of the Legislature, and Secretaries of Departments. Political activity shall consist, among other things, in candidacy for elective office, being a delegate to any political convention or a member of any political committee or directorate or an officer of any political club or other similar political organizations, making speeches, canvassing or soliciting votes or political support in the interest of any party or candidate, soliciting or receiving contributions for political purposes, either directly or indirectly, or becoming prominently identified with the success or failure of any candidate or candidates for election to public office. The prohibitions herein contained apply to political activity with respect to the political parties of the United

States as well as of the Philippine Islands. Violation of this section shall be considered cause for removal from the service.

It is requested that this circular be brought to the notice of all officers and employees under your jurisdiction, classified or unclassified, permanent or temporary.

Very respectfully,

P. R. ANGELL,
Director of Civil Service.

MANILA, *March 19, 1919.*

Constructing Division. Memorandum No. 21.

SIR: I have to invite your attention to the subjoined circular, dated February 1, 1919, relative to the use of the Insular Cement-Gun, Sandblast, and Pneumatic Chisel Equipment. The salary, subsistence and traveling expenses of the operating crew are charged directly to the project on which they are engaged.

In view of the demand of this equipment by other provinces, advance notice should be given the Manila Office if you contemplate to use same at any time, so that its itinerary might be arranged accordingly.

For the Director:

C. E. GORDON,
Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
DESIGNING DIVISION,
PROPERTY DIVISION,
MR. R. H. TREASH AND
MR. JOSE DEL CASTILLO.

MANILA, P. I., *February 1, 1919.*

Designing Division.

CIRCULAR.

On the use of the Insular cement-gun, sandblast, and pneumatic chisel equipment.

The following outline of uses to which the Insular cement-gun equipment may be applied, is submitted for the information of District Engineers, who will undoubtedly be able to profit by its application to provincial projects.

The outfit comprises a 30-horse power 4-cylinder gasoline motor, belt connected to an Ingersoll-Rand air compressor, all mounted on a substantial steel truck; two pneumatic chisels; a J. M. Betton sandblast machine; and a type N-1 cement-gun; aggregating, with accessories, nearly 5 tons weight.

With the exception of the pneumatic chisels, which are now being added to the equipment, the apparatus is fully described and its operation explained, together with photos, in an article by Mr. L. H. Thompson, Mechanical & Electrical Engineer, published in the Bureau of Public Works Quarterly Bulletin for July, 1918.

The pneumatic chisels are of the standard hand type operated by compressed air, delivering 2,200 blows per minute, and weighing less than 5 pounds each.

The operating crew permanently assigned with the outfit comprises:

1. Foreman at a salary of ₱100 per month and subsistence.
1. Mechanic at a salary of ₱100 per month and subsistence.
3. Trained operators at ₱1.50 per day.

Additional laborers should be secured locally, as required.

A nominal rental of ₱2 per day is charged to provinces using the outfit, in order to cover expenses for upkeep and repairs.

The supplies usually required, include the following items:

1. Cement.
2. Fresh sand (not salty) for concrete.
3. Fresh water for concrete and for cooling the engine.
4. Gasoline.
5. Coal for forge work.
6. Sharp quartz sand for sandblasting.

In connection with the last item, it may be stated that considerable difficulty has been encountered in securing good blasting sand. Tarlac River sand has been used with only a fair degree of success. A large proportion of the *sands* found in the Islands are of a soft variety, with only a small proportion of hard quartz crystals. Soft sand has but little value for blasting purposes, as it rapidly powders and is blown away as dust, without doing effective work on the steel.

A few of the many uses for which the equipment is suited, may be outlined as follows:

(*a*) *Cleaning steel bridges and other structures for repainting.*—Experience in the painting of exposed steel structures indicates that new paint will not prevent further corrosion unless all old paint and rust is cleaned off down to bright steel, immediately before painting. For removing the last traces of corrosion from steel, the sandblast apparently has no equal, and its use is practically indispensable for a good job of steel painting. In the United States, the sandblast has proven efficient in removing heavy coats of rust, scale, and old paint, but owing to the poor quality of blasting sand available in the islands, the removal of paint and heavy rust by the sandblast alone, has not proven exceptionally efficient from a financial standpoint. On previous work, the heaviest of the rust was removed by a gang of men with chisels, after which the sandblast scoured the steel very effectively. The hand labor of chiseling thus involved, however, has proven very slow and costly. Upwards of six months labor for a large gang of men with chisels was required in cleaning the Sta. Cruz bridge, Manila, for repainting. In order to save this labor, two pneumatic chipping hammers fitted with chisels, are now being added to the equipment. These two tools, operated by compressed air from the compressor of the cement gun outfit, and each delivering 2,200 blows per minute, should be equivalent to fifty or more laborers for knocking off old paint and heavy rust. It is believed that eight men with the pneumatic chisels and sandblast equipment should be able to clean and paint an ordinary steel bridge in less than three weeks at a total cost of perhaps ₱1,300.

(*b*) *Coating old steel structures with concrete placed by the cement-gun.*—In the United States, the cement-gun has been employed to a considerable extent for preserving old steel structures by covering them with from one to five centimeters of concrete, either with or without additional steel reinforcing. In some cases the steel work was wrapped with poultry netting, onto which the concrete was blown by the cement-gun. The coating of steel structures by a thin coat of concrete has been considered by some, as more permanent and economical than repainting. In some instances steel structures that were corroded to the point of being considered unsafe, have been satisfactorily reinforced by a coating of "gunite," as the cement gun concrete is technically called, so as to save the cost of a new structure. In work of this character the old paint and rust should be removed by the pneumatic chisels and sandblast, and additional reinforcing rods and wire should be placed where considered necessary, before the whole is covered up by the cement-gun.

(*c*) *Repairing defective reinforced concrete structures.*—There are in the Islands a number of reinfoced concrete bridges and other structures in which the reinforcing steel has been corroded through the electrolytic action of salt, resulting in bad cracks, and in some cases even splitting the concrete off from entire girders, and exposing the steel to view. Provided repairs are not postponed to the point where the steel is practically destroyed by corrosion, these structures may in some cases be saved by the cement-gun process, briefly as follows:

The old concrete is chipped away by the pneumatic chisels, giving access to the steel. Most of the rust is removed by the pneumatic chisels, and the steel is then scoured bright by the sandblast. The cement-gun follows immediately, covering up the steel with a dense, non-porous, and adhesive mass of concrete, and building up the girder approximately to its original size and shape. No pouring forms or crowels are used in this work.

It is estimated that a defective reinforced concrete deck girder bridge of five spans, could be repaired by 8 or 10 men using this process, in less than one month, at a total cost of less than ₱2,000.

(*d*) *Bush Hammering and similar work on concrete buildings.*—Many public buildings of concrete, erected in the Islands, require bush hammering over the entire concrete surface. To accomplish this by hand, would be a tedious process, and would require a number of workmen of some skill. It is believed that a few men outfitted with pneumatic chisels would accomplish more than fifty hand hammers, and that the results would be more uniform, and of better appearance.

The cement-gun can also be used to advantage in constructing sewers and tunnels, repairing adobe walls and buildings, placing "stucco" and other plaster finishes, preserving timber piles against the teredo and other insects, waterproofing dams and retaining walls, building thin concrete partitions on expanded metal foundations, etc.

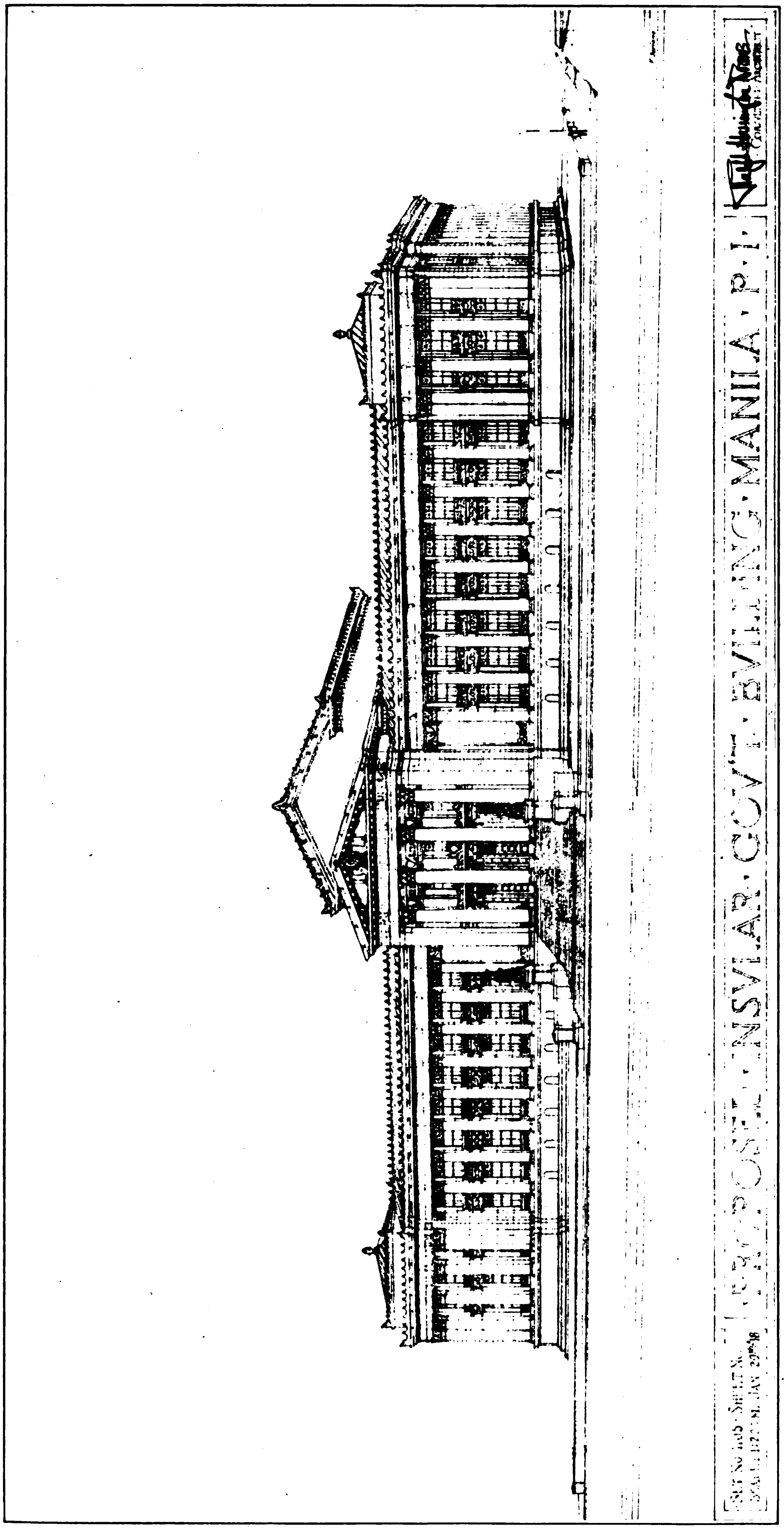
The cement gun process of application, above described, is claimed by the manufacturer to produce a very superior quality of concrete, for several reasons:

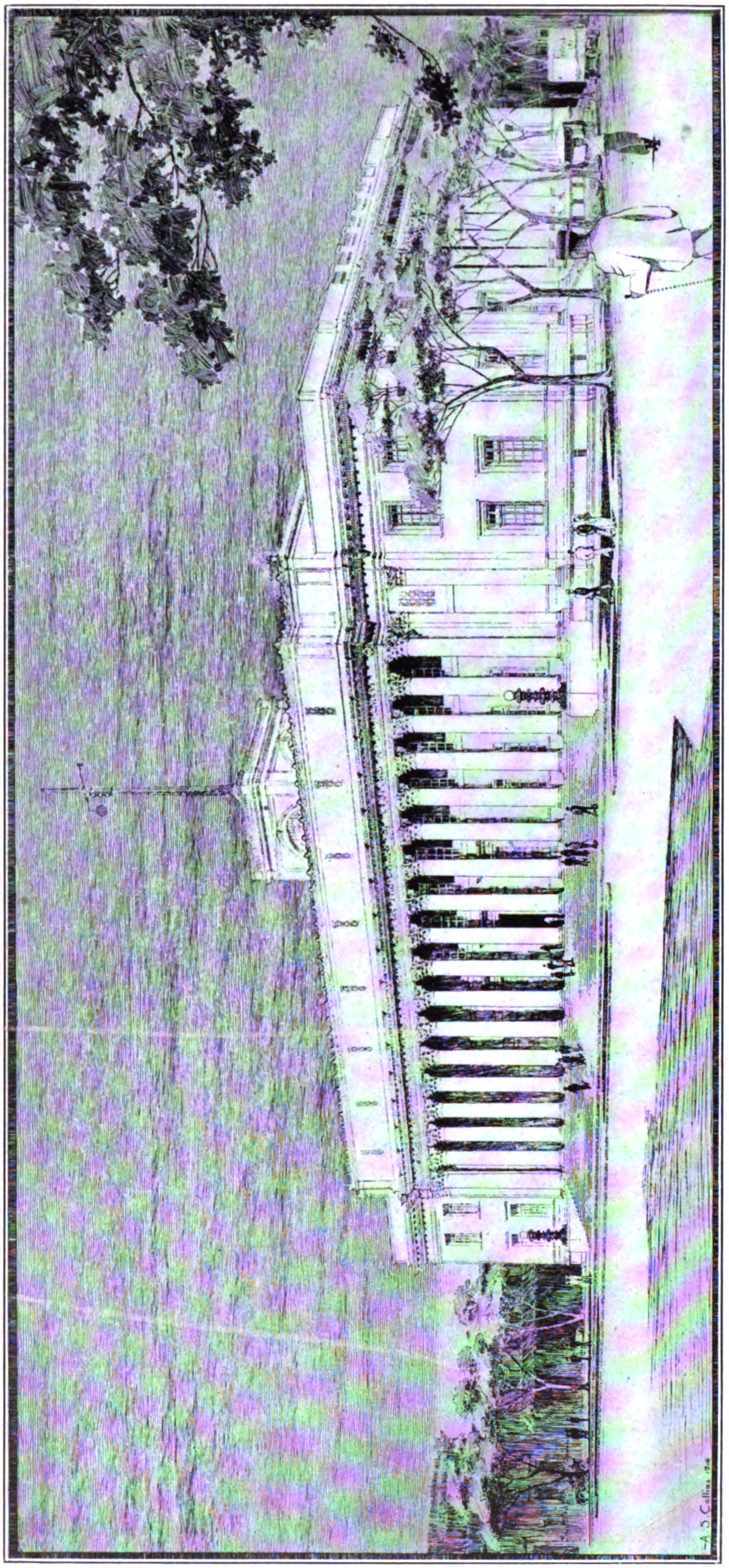
(1) Due to hydration at the instant of application, all the advantage of the initial set is retained. There is no subsequent working over, or mixing such as necessarily occurs in hand or machine mixed mortars.

(2) The method of application by forcible projection produces an exceptionally dense, non-porous mass.

(3) Due to a natural outcome of the process, the bonding to steel and old concrete is much more effective than by ordinary processes. This is occasioned by the tendency of the sand particles to rebound from hard surfaces. The cement adheres, forming a layer of practically neat cement, tamped and forced by the rapidly hammering sand particles, into intimate contact with the bonding surface. This perfect bonding should effectively prevent further corrosion of steel. Tests of gun-placed concrete or "Gunite," have proven the soundness of the manufacturer's claims in the States. In tension, compression, adhesion, impermeability, etc., as compared with other mortars of similar proportions, "Gunite" has, in every case, proved markedly superior.

District engineers are urged to consult with the Mechanical and Electrical Engineer concerning the feasibility of using the equipment on provincial projects.


PROPOSED · INSULAR · GOV'T · BUILDING · MANILA · P · I ·
CONSULTING ARCHITECT



Proposed Custom House, Manila, P. I.

APPENDIX B.

PROJECTS ACTIVE JANUARY 1, 1919.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	3	3																		1							1	1			2		1	12
Agusan	5	5				1														1						1					1		2	16
Albay	5	4								1										1	1			2		1							1	16
Ambos Camarines	5	10		1	1		1			1			5							7	1	1		1	1	1							3	39
Antique	8	2								1										2				2				1					1	17
Bataan	5	4			2		1				1									2											1		1	17
Batangas	5	5			1					1		1							1	9	1		1	9	2			7				1	20	64
Benguet	16	4					1	1					3							2	1	1		5		10		2	1			1	7	55
Bohol	5	3		1	9												1			7				1		2		4					3	36
Bukidnon	3	1			2																							1			1		2	10
Bulacan	8	4		1	1															5													3	22
Cagayan	5	2											1							1		2				2	1						19	33
Capiz	12	2			7			1												4			1				1						1	29
Cavite	5	2																		2				3				1					8	21
Cebu	10	2			1								1							4			1	4	1			8					35	67
Cotabato	9	4			2															6				1		4	1	3			2		8	40
Davao	8	3			1															1						3					2		11	29
Ilocos Norte	5	2							1											4			1					1					1	15
Ilocos Sur	8	3							2									1		5				2		1	1						5	28
Iloilo	9	3	4	2	2															1					1	2		1			1		4	30
Isabela	4	2							1				4							5													3	19
La Laguna	5	2	1					1												10		1		1	1			2		1			6	31
Lanao	5	3		2		1														3							1				1		5	21
La Union	4	4			1															5				2	1	2							2	21
Leyte	6	3							1		1		4					1		2		1		2							1		6	28
Mindoro	3	3		1					1	1			1							3	1				1			3					5	23
Misamis	4	3		1	1				1																			1						11
Mountain Province	11	11			3								7	4					1	4	1	1		1			5				1	1	13	64
Nueva Ecija	7	2											1							6				1							1		3	21
Nueva Vizcaya	5	8		2																7		4									2		2	30
Occidental Negros	13	2		1	4			1																1			1						1	24
Oriental Negros	5	6								2			1							3	1							2			1		3	24
Pampanga	6	7			2								1							6				1			1	1					1	26
Pangasinan	14	4	1		2				1			1	2							2		1		1								1	2	32
Rizal	8	8			1			1									1			2		1		1							1		2	26
Samar	8	2																		3				1			1	1					5	21
Sorsogon	8	4						1									1			3		1		2				1					1	22
Sulu	4	2								1										6				3		1					2		13	32
Surigao	1	2									1										1	1											1	7
Tarlac	10	3			2				1				1		1	1				1														20
Tayabas	8	3																		1		1		2		1		2					5	23
Zambales	1	3			1															1													2	8
Zamboanga	6	5																		3	1				1						1		5	24
Total	285	160	6	12	46	2	3	6	9	8	3	2	32	4	1	1	3	2	2	141	9	16	4	49	9	31	14	43	1	1	21	4	224	1,154

NOTE.—Of the 224 projects under the caption "Miscellaneous," there are 13 surveys and investigations of roads, bridges and hydrographies, etc., 11 wharves, 7 irrigation systems, 16 hospital buildings, 8 boundary monuments, 8 irrigation ditches, 3 dykes, 3 dredging projects, 8 docks, 1 custom house, 7 dams, 14 constabulary buildings, etc.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

CLAUD RUSSELL, *Director of Public Works (on leave)*
C. E. GORDON, *Acting Director of Public Works (also Chief Constructing Engineer)*
E. C. EARLE, *Acting Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer (on leave)*
JUAN ARELLANO, *Supervising Architect*
TOMAS MAPUA, *Supervising Architect*

Supervising Engineers
L. S. Boggess
J. C. Cookingham
C. S. Dandois
Marcial Kasilag
J. T. Marshall
B. F. Mills
A. T. Sylvester

Hydraulic Engineer
G. G. Stroebe

Designing Engineers
E. C. Earle
Jose Paez

Irrigation Engineers
R. H. Shoemaker
Gonzalo Garcia
Luis Francisco

Chief Hydrographer
Nicanor Cortes (acting)

District Hydrographers
F. T. Ryan
W. Demers

Electrical and Mechanical Engineers
L. L. Vincent
W. A. Newton
L. H. Thompson

Structural Engineers
H. Roy Kingsley
V. L. Legarda

Chief Architectural Draftsman
Cheri Mandelbaum

Architectural Draftsmen
J. Altiveros
C. A. Barretto
A. Toledo

Assistant to the Director
C. A. Tansill

Superintendent of Artesian Wells
A. W. Wolf

Chief Accountant
Rosendo Reinoso

Cashier and Disbursing Officer
Teodoro Camu

Division Clerks
Artemio Abaya
M. Limlingan
Hilario Reynera
Salvador Reyes

District Engineers
R. N. Allen
Alejo Aquino
Jose Arquisola
J. V. Bagtas
Sotero Baluyut
N. R. Baugh
F. H. Campbell
Hilario S. Clemente
Mamerto Cruz
Manuel Diaz
Maximo Dimson
Leandro Espejo
Severino Fernandez
Vicente Fragante
R. S. Frush
Jose Gandionco
Rufino Garcia
Domingo Guanio
W. J. Hollis
W. B. Honska
Leon Ines
Agustin Jereza
V. S. Kilby
Isabelo Lagniton
Saturnino Lopez
Jose Lozada
Juan Macaraeg
Graciano J. Militante
Vicente Orosa
Lorenzo Ortiz
Mateo L. Roco
N. S. Saleeby
Valeriano Segura
E. D. Smith
Silvestre Tan Chauco
Antonio Tayzon
L. R. Tillett
Dalmacio Urtula
Jose Villanueva

Assistant Engineers
A. C. Babcock
F. P. Reynolds

Superintendent of Dredges
Vicente Castillo

Civil Engineers
Pastor Gomez
Manuel Reyes
Teofilo Reyes
Pedro Siochi
Julian Vallarta

Assistant Civil Engineers
Melecio Arranz
Arturo P. Nitorreda
Jose Wright
Jaime Laguardia
Manuel Gonzales

Junior Civil Engineers
Gregorio Alcantara
Jose A. Aldea
Alfonso Altimerano
Gustavo Cruz
Ambrocio Diaz
Isaias Fernando
Jose F. Imperial
Fidel V. Larracas
Vicente Lavadia
Luis Mallari
Teodoro Mocorro
Marcelo Operario
Emilio Perez
Martin M. Resplandor
Rafael Ungson
Liborio Urtizberea
Gonzalo Vales
Rosalio Villalon

Junior Electrical Engineer
Vicente Villanueva

Superintendent of Automobiles
Juan Piedad

Superintendent of Benguet Auto Line
Pastor Avisado

Property Clerk
Jose de Jesus

Traveling Inspector
Jose del Castillo

Law Clerk
Eusebio Barba (acting)

Record Clerk
Primo Villar

BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS

Quarterly Bulletin

VOL. 8 APRIL 1, 1919 NO. 1

No. 25094. Michelin Gold Medal. Awarded to E. D. Smith, D. E., Ilocos Sur, P. I., for best road maintenance, 1917.

171685

THE MICHELIN MEDAL.

In connection with the Michelin road maintenance prize competition for 1917, the details of the result of which were published in the January 1, 1918, issue of this Quarterly Bulletin, there is herewith presented a beautiful photogravure of the Michelin Medal which was awarded to Mr. E. D. Smith, District Engineer of Ilocos Sur, P. I. This is a solid gold medal designated as special Michelin prize awarded to the District Engineer whose subordinates have succeeded in winning more money prizes than those of any other districts.

As may be remembered there were ten ₱50 Caminero and five ₱100 Capataz prizes awarded to the individuals who have done the most meritorious work in maintenance on a section of road. This total amount of ₱1,000 is a voluntary donation offered by Levy Hermanos, proprietors of the Estrella Auto Palace, and Estrella del Norte, Manila, P. I., and of the various jewelry establishments in several important provinces of the Islands.

To enable one to appreciate the benefits derived from this competition, it is only just that attention be directed to the road activities mentioned in the Project Notes by District Engineers on page 15 of this report.

The committee of award was composed of Messrs. Theobald Diehl, of Levy Hermanos; Romarico Agcaoili, Second Assistant to the Director, B. P. W.; and W. C. West, Highway Engineer, B. P. W.

Michelin Medal
for the
Best Maintenance of Roads during 1917
Awarded to
Mr. E. D. Smith
District Engineer Ilocos Sur
Philippine Islands

No. 25093. Reverse side of the Michelin Gold Medal.

EXCERPT FROM THE MINUTES OF THE SEVENTH ANNUAL DISTRICT ENGINEERS' CONFERENCE HELD AT MANILA, P. I., FEBRUARY 5-12, 1920.

[RESOLUTION NO. 8.]

Whereas, God in His infinite wisdom has seen fit to remove from our midst our esteemed friend, colleague and co-worker, Mr. Arthur W. Austin, late District Engineer of Nueva Ecija, P. I.;

Whereas, Mr. Austin has shown loyal devotion to duty and the interests of the Bureau of Public Works;

Whereas, due to his untiring efforts he has contributed largely to the progress of public works in the provinces;

Whereas, his untimely death is a great loss to the organization of the Bureau of Public Works;

Be it resolved, that the District Engineers in their Seventh Annual Conference express their most heartfelt sympathy to the bereaved family of the late Mr. Austin, in this, their great sorrow.

Be it further resolved, that copies of this resolution be sent to the family of Mr. Austin and embodied in the records of this conference.

Unanimously adopted by the Conference, session of February 12, 1920.

(Sgd.) VALERIANO SEGURA,
Secretary,
Seventh Annual Conference of District Engineers.

QUARTERLY BULLETIN

BUREAU OF PUBLIC WORKS
MANILA, P. I.

ISSUED QUARTERLY UNDER THE DIRECTION OF
THE DIRECTOR OF PUBLIC WORKS

G. A. RICO, COMPILER

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FOREWORD.

During the year 1919, the operating efficiency of the Bureau of Public Works, in proportion to the actual pace of time, has been handicapped due to the shortage of the proper number of experienced men. The Bureau passed through the most critical period of its existence brought about partly by the separation from the service of twelve (12) of its most valuable men as may be seen from the following reports. Added to this is the fact that there exists a surprising scarcity of available men with sufficient technical training who could be induced to join and reinforce the reduced ranks of the Bureau.

The following B. P. W. report of resignations of technical and semi-technical employees is eloquent evidence of this shortage of trained personnel:

	Title.	Americans.	Filipinos.	Total.	Average length of service.
					Years.
Number of voluntary resignations	C. E	2		2	7
Do	J. C. E.		1	1	4
Number of separation due to retirements	C. E	5		5	10
Do	Overseer	1		1	5
Number of deaths	C. E		1	1	10
Do	Rd. Supt.	1		1	10
Number of separation for other causes	J. C. E		1	1	5
Total number separated from service				12	7

Of the twelve men lost by the Bureau during 1919, one was Director of Public Works, one Chief Constructing Engineer, one Acting Constructing Engineer, five District Engineers, one Civil Engineer, one Irrigation Engineer, one Overseer, and one Junior Civil Engineer. The Bureau also lost temporarily two American Supervising Engineers who have been in the United States since March, 1919, on leave. These men as may be gathered from the above reports have had an average of seven years of satisfactory and creditable service in the various important divisions of the Bureau where executive and technical ability was an essential requirement.

As a result of the shortage of personnel, both in the Central Office and in Engineering Districts, the publication of the four issues (April 1, July 1, October 1, 1919 and January 1, 1920) of the Quarterly Bulletin has been inevitably delayed. However, we shall endeavor to publish these missing numbers as soon as possible.

A little investigation of recent developments will reveal to us the facts that constitute the real and direct causes of the above anomally. Concerns both private and government in the United States and Europe are now offering more than 100 per cent than the salaries paid before the war. Industrial concerns in the Islands are attracting the cream of the engineering brains, offering them much higher salaries than what the Government is able to give at present.

There is an urgent necessity of arousing public opinion and public officials to the grave peril that is now threatening the stable and efficient administration of this Bureau. It is obvious that if the Bureau of Public Works is to continue its operation and is to retain competent engineers in the service, it must pay salaries at least approximating the rate paid by private entities. Experienced engineers have been in demand for the last couple of years, and the Government has found itself impotent to retain them in the service under the existing salary schedule. Perhaps some one might advance the theory of a "penny wise, pound foolish" practice of paying low salaries to public officials, on the ground that low salaried men would do just as well in the actual jobs, but experience has shown the fallacy and the disastrous effect of this "just-as-well" mode of dealing with present contingencies.

It is a source of gratification to note that there are already some sign of awakening on the part of the responsible officials to the fact that the existing rate of pay of the public servants are inadequate in proportion to the present high cost of living, and these signs are observed in the new bonification plan which increases 25 per cent and 15 per cent the salaries of employees receiving ₱2,400 or less per annum and over ₱2,400 per annum respectively. But, is this increase of pay proportionate to the increase in the high cost of living? Unfortunately our observations convince us otherwise. Although we have no official data to back us up, yet we may safely and modestly state that the increase in the cost of living is from 100 per cent to 150 per cent. It is a fact that cannot be overlooked that the peso of today has only about 30 per cent of its purchasing power four or five years ago. It does not require a knowledge of higher mathematics to determine how long Government employees will consent to be miserably underpaid under living conditions obtaining at present.

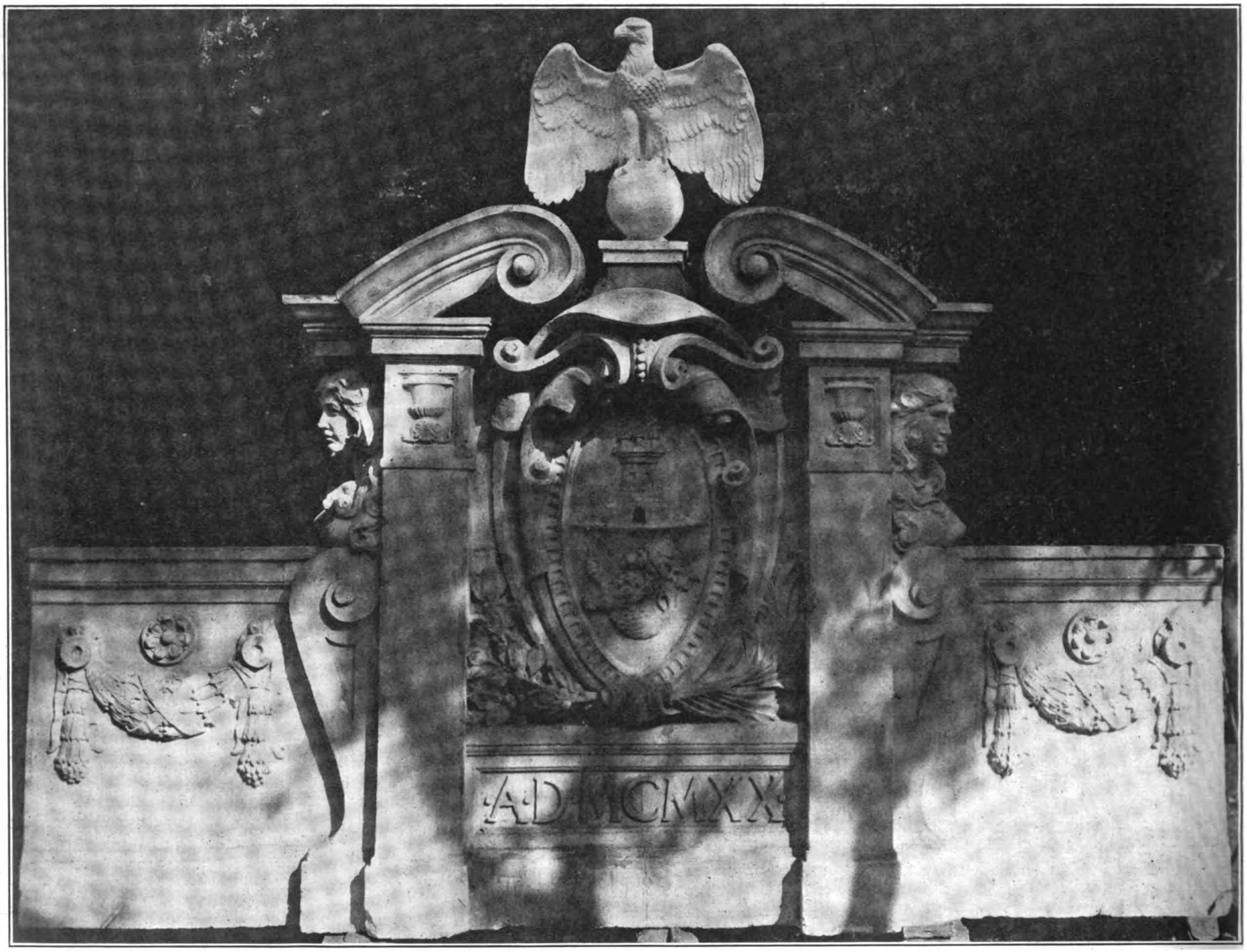
There presents an only solution to this actual problem, namely, revision of the existing salary schedule. It would be but an act of justice that the salaries of employees be increased by a proportion commensurate with the actual cost of living.

THE EXECUTIVE BUILDING.

By Tomás Mapúa, *Supervising Architect, B. P. W.*

The Executive Building on Malacañang grounds now approaching completion, will be one of the notable works of Mr. Ralph Harrington Doane, former Consulting Architect of the Philippine Islands—notable for its dignity, simplicity and refinement. It further contains an interest that few structures of so severely Renaissance a type of design possess. It expresses an unusual degree of individuality and represents an activity of marked public importance.

The way Mr. Doane attacked the problem of giving expression both practically and artistically to the peculiar underlying purpose of the Executive Building is remarkable. It expresses externally a plan and a grouping of architectural units carefully designed to serve the purposes for which the edifice is specifically intended. The function of the building, aside from being partly the home of His Excellency, the Governor-General of the Philippine Islands, is to house under one roof, his office work and that of the Vice-Governor. It was, therefore, determined to make the building nearer the type of the residence than the impersonal public building, although as dignified as the subject demands, so that His Excellency, the Governor-General, might have a dignified and stately place where to receive distinguished visitors of the Philippine Islands and not in a common place meeting room. To this end the whole building while of a distinctively monumental character, has been infused with what might be called a sense of "stately domesticity" as in certain palaces that express their character as habitations while they stand for some preëminent public purpose.



Central motive of main façade. Malacañang Executive Building, Manila, P. I.

The conditions that determined the style of architecture were the circumstances imposed by the generally classic renaissance character of monumental building proposed to be implanted especially here in Manila. It was important that this edifice should therefore stand out as the basis or the standard of construction in the future.

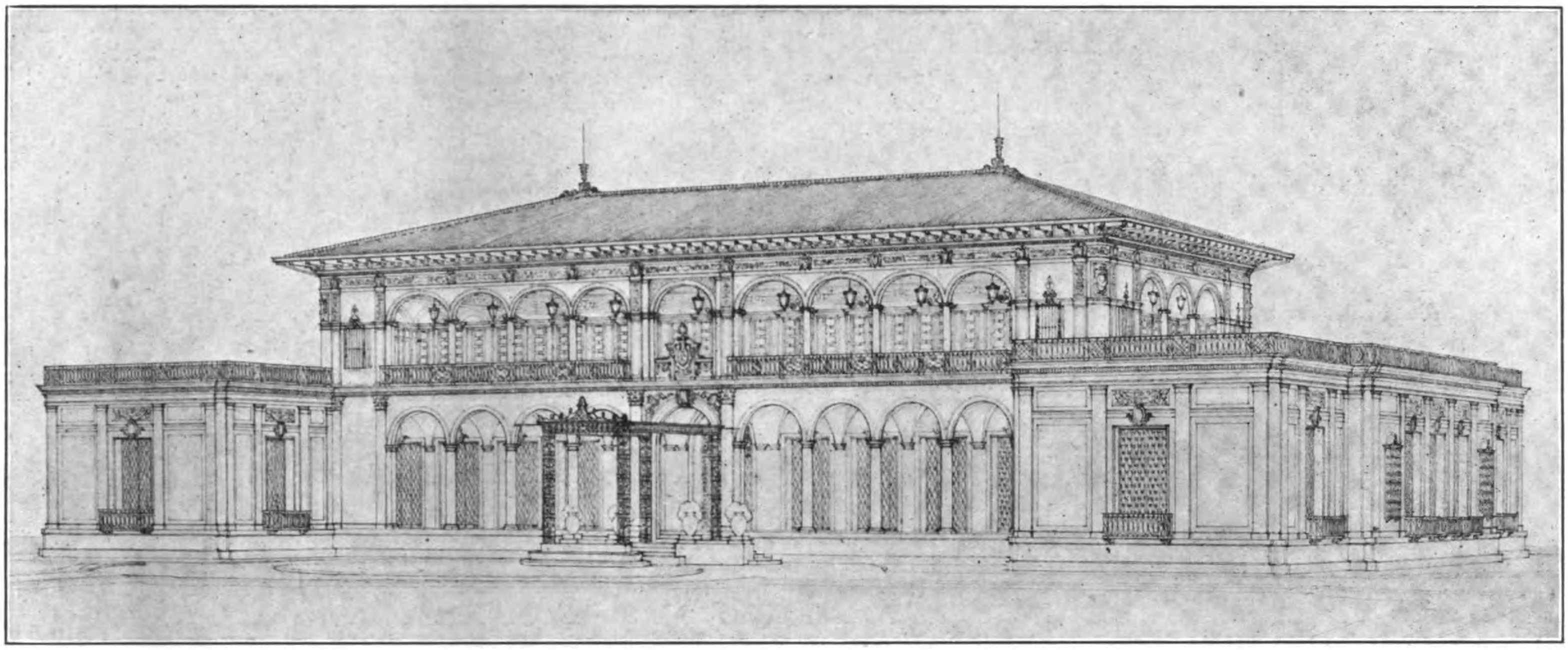
The building in plan has the shape of a capital letter "H" with dimensions of about sixteen meters deep by fifty-five meters in length. The character of the design may best be described as that of a rich simplicity expressing an agreeable combination of Italian and Spanish Renaissance motives. The flat tile roof that covers the main structure contributes materially to this impression. The loggias surrounding the central portion, both in the lower and upper story give an air of coolness and openness. Against the main structure, as thus developed, are placed the two elements at either side that contain the working offices. It will thus appear that the internal function of a building could hardly be more clearly expressed than in this design that so logically grows out of the plan.

The exterior of the building is entirely of synthetic artificial stone, composed of granulated particles of handsome Romblon marbles mixed in cement in such proportions as to make the particles of marble completely preponderant. The surface of this composition is tooled to expose the marble aggregate, thus producing a charming color tone by virtue of the exposed particles of marble.

To appreciate the many intricate problems that the constructing engineer has to overcome I quote an excerpt from a report on this subject by Mr. H. H. Houk, Acting Constructing Engineer, Manila:

"The building is of special interest to the constructor because of the type of hollow wall construction throughout and the extra large percentage of openings, combining the desirable features of non-conducting walls with abundant light and ventilation.

"Hollow wall construction means an extra amount of form work and ornamental mouldings a large amount of expensive form work. The inside forms of the hollow walls were in the main constructed



2551. Perspective view of Malacañang Executive Building, Manila, P. I.

of cement barrel salvage from the work. The foreman ingeniously improvised an attachment to the circular saw mandrel enabling the form mouldings to be cut quickly and cheaply.

"The integral surface veneer which is one inch to two inches in thickness is of marble quarried in Romblon, crushed there, and shipped in sacks by interisland steamers to Manila. From these boats, it is taken to the building site by lighters and there crushed by rolling to such a size as will pass a ¼ inch screen. This aggregate, mixed with ordinary cement 1:3, is poured integrally with gravel concrete backing, using plain sheets of 22 gauge galvanized iron to separate the surface veneer from the gravel concrete backing. These plain galvanized sheets which are of the height of the forms are placed between the face of the form and the reinforcing steel. The ordinary concrete and the facing mix are placed simultaneously on their respective sides of the separating sheet, care being taken to raise the metal sheets, by means of handles riveted to their top, before initial set takes place. Much extra labor and care is required in the placing of the two mixes to prevent leakage through the joints of the metal forms and to prevent deposits of gravel aggregate accidentally falling in with the facing material.

EXECUTIVE BUILDING ORNAMENTS

Made of crushed and powdered Romblon marble and Portland cement.

These ornaments were designed by the Bureau of Public Works and executed by Nepomuceno and Tampico, local sculptors and engravers.

Door head cartouche. Interior of Hall.

"The difficulties arising are mainly those of form bracing since the interior of the form must be kept clear of obstructions in order to allow the placing and removal of the galvanized iron form sheets.

"The writer used ordinary wire netting 1/16 inch mesh in places where it was difficult to use galvanized sheets to separate the mixtures and the cost of the wire was much less in these cases than the extra labor and time involved in the use of galvanized sheet. This were netting separator, it is believed, caused no loss in strength since the cement from both mixtures filtered through the mesh and combined to make a rich connecting film through and around it. Arched ceilings and lintels were faced by pouring about one inch of the facing mix just enough ahead of the ordinary mix, so that it was at the point of initial set when the ordinary gravel concrete was placed on top.

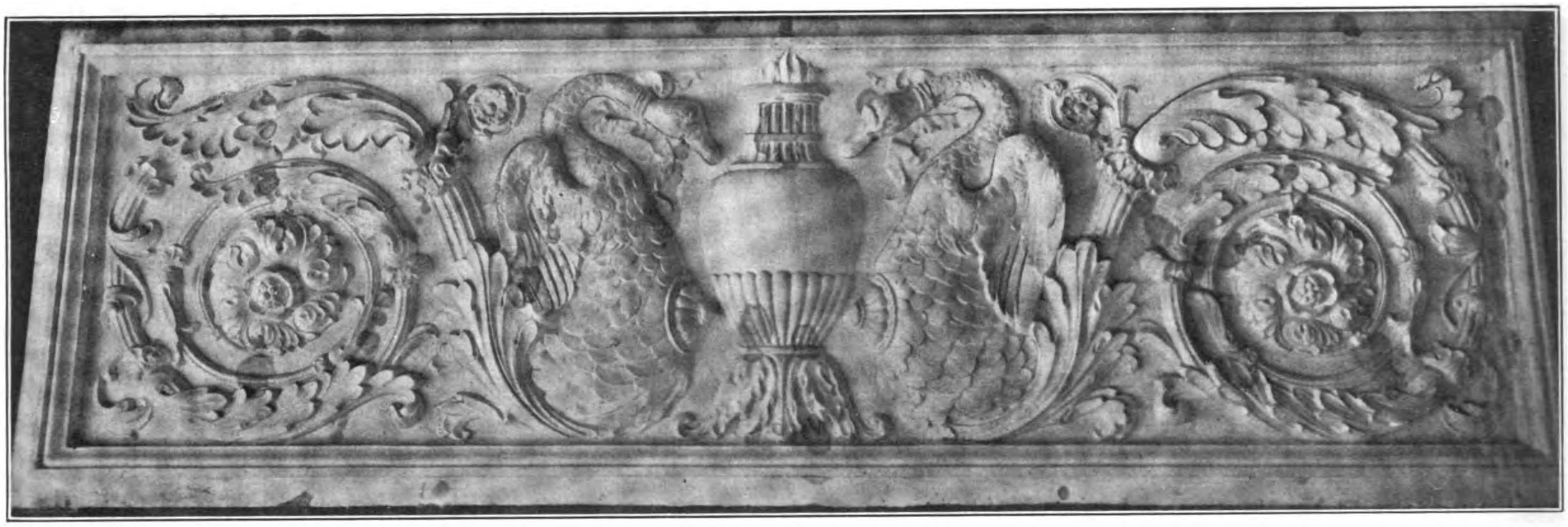
"The veneer is being finished and dressed to accurate lines by Boyer pneumatic hammers fitted with bush hammer tools made on the job from blanks furnished by the manufacturers. The work is cheaper, more uniform, and much faster than by hand. No surfaces are finished until the concrete is at least two months old as the aggregate will come loose from the matrix instead of chipping off, if not thoroughly cured. Concrete that has stood too long, while giving a somewhat improved appearance, requires an excessive amount of work to finish.

"The ornamental concrete work, which is also of marble aggregate, is being done by contract, and the work is extra ordinarily well done, and shows the wonderful possibilities of concrete in the hands of native artisans.

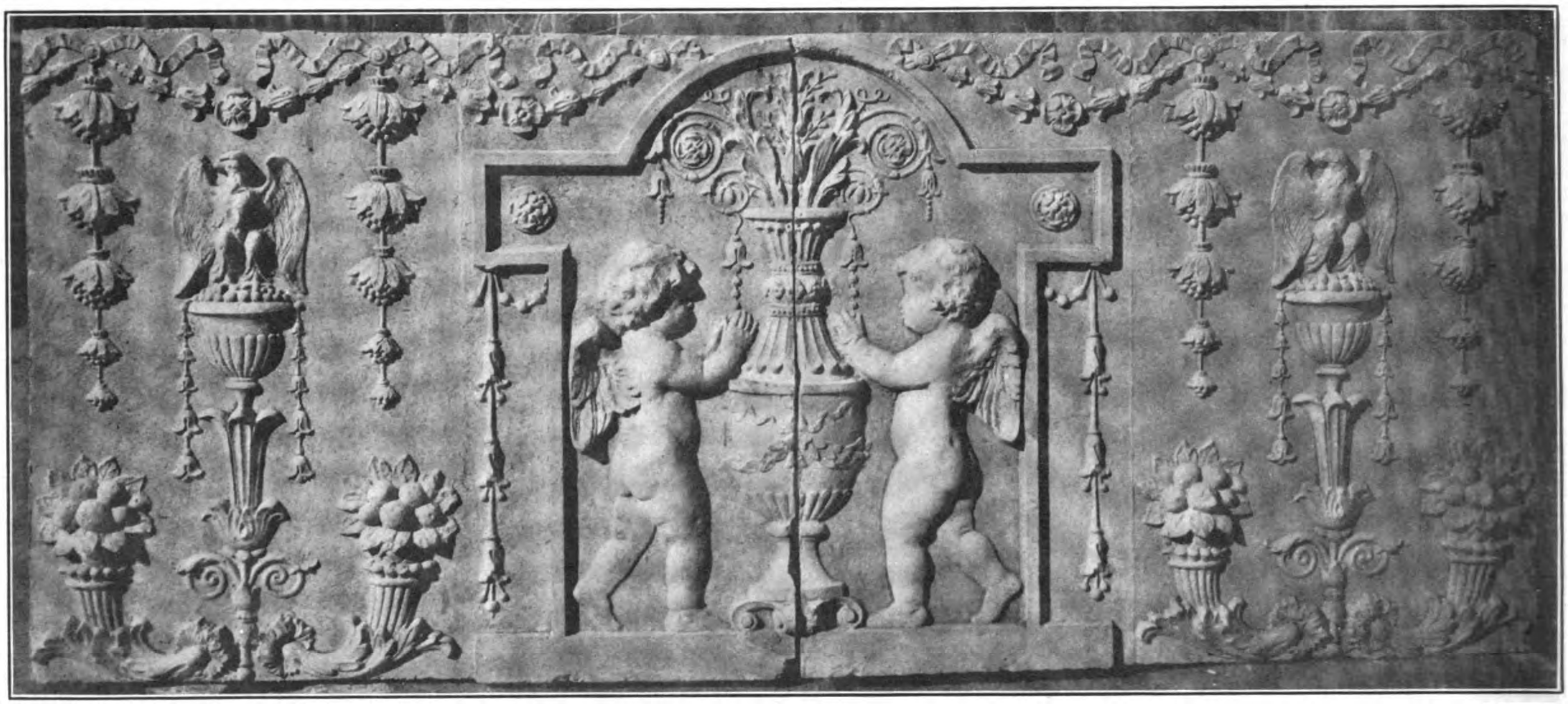
"The ornamental wood work will be a feature of the building, as it should be, and the foreman is ably responding to his task in the frames and panelling. The ornamental carving will be done by a capable local firm. This work in the completed building will be of utmost interest to those visiting the Islands and will be a source of pride and gratification to the Island's representative.

"The one thing that was most forcibly brought out in the search for finishing lumber in the Islands, is that, in this country abounding in wonderful finishing woods, the available market supply of narra is woefully small and no little time was spent in searching for red narra as called for in the specifications. One dealer showed a call from the United States for 100,000 board feet of red narra

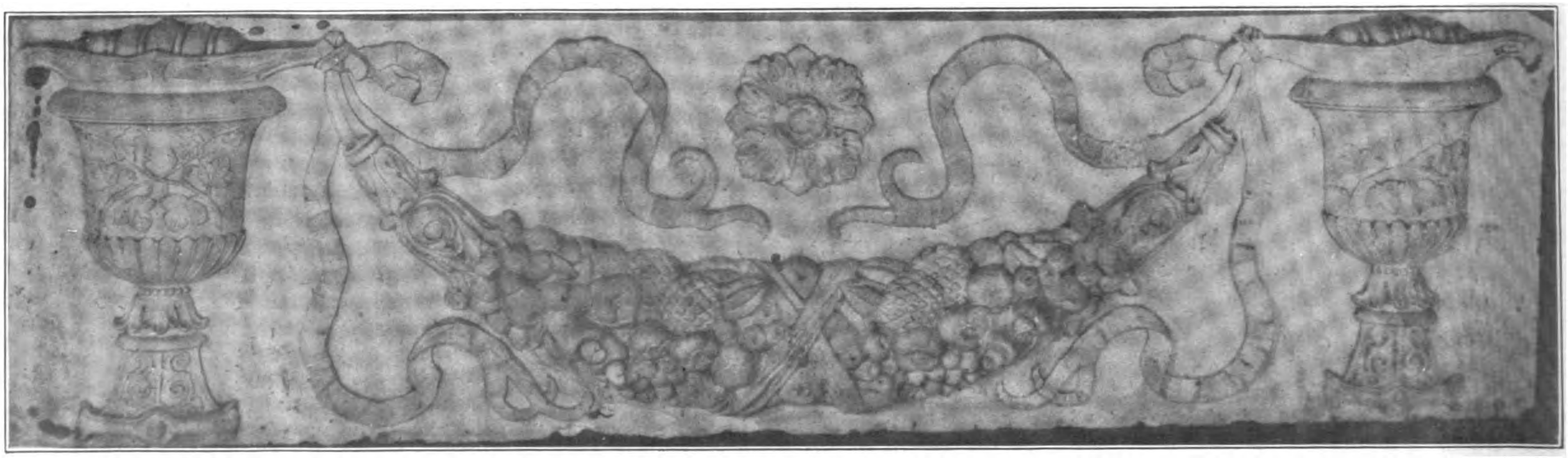
EXECUTIVE BUILDING ORNAMENTS



One of the ornamental panels. Main Office.



Portion of the ornamental frieze. Reception Room.



Decorative panel. Exterior of the building.

EXECUTIVE BUILDING ORNAMENTS

One of the ornamental panels. Governor General's Office.

at ₱1,200 per M. F. O. B., Manila and said he could not secure that much in one year's time.

"The construction equipment includes a one-half batch Ransome side loading mixer with an independent improvised electric hoist and wooden chuting tower.

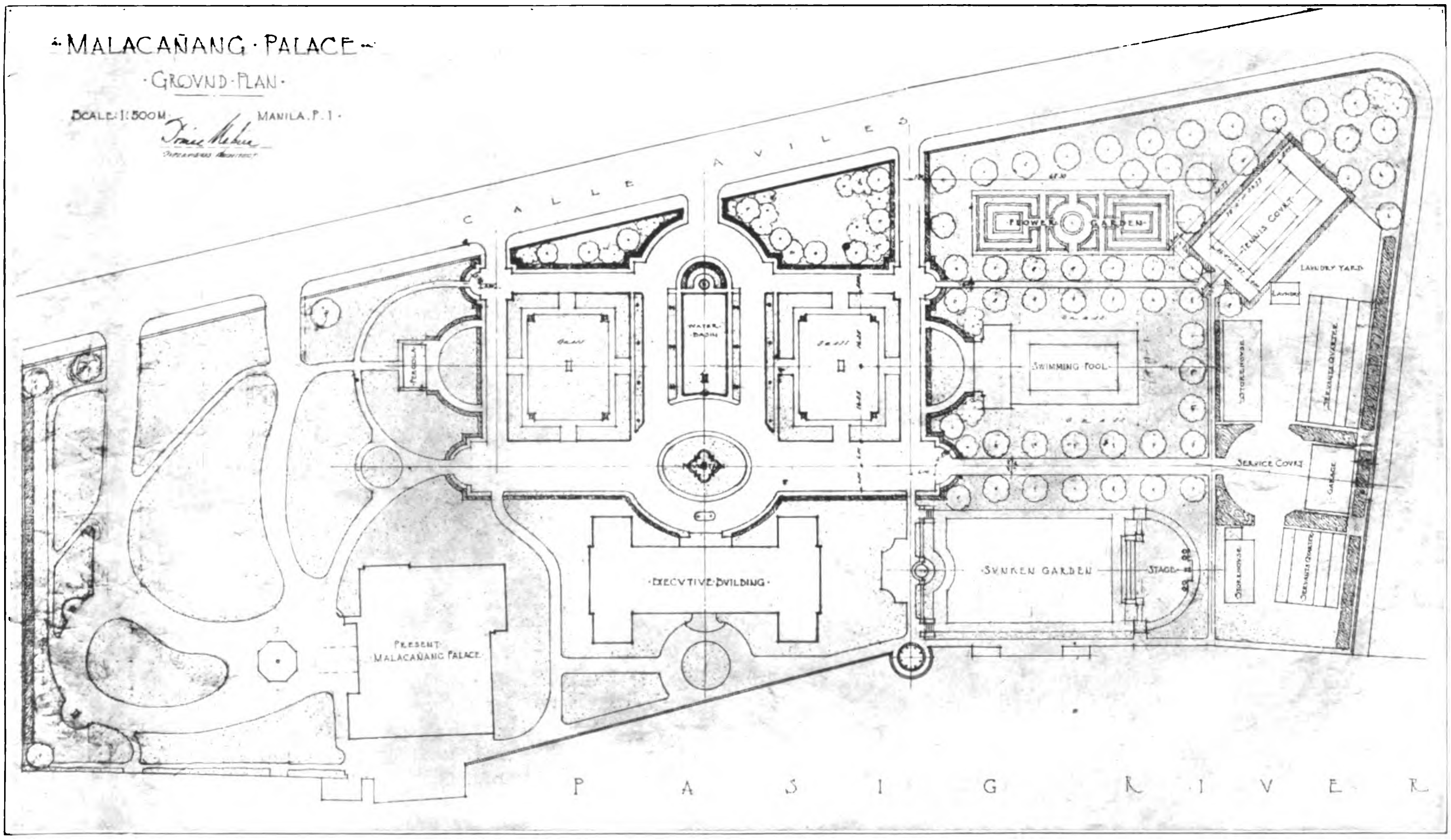
"A locally constructed circular saw and a 24-inch surfacing planer, both run by a 10 horse power motor, have saved much labor during the scarcity of carpenters, as well as saving their first cost many times over in the amount and quality of the work done.

"The oil engine which furnishes power for the mixer is used, when no concrete is being poured, to run an air compressor which now furnishes power to the pneumatic stone hammers and later will be used to operate the riveting hammers when erecting the roof trusses.

"It was fortunate that the plumbing accessories were advertised at a time when the representative from a firm in the United States was in Manila and in addition to securing a good price, special fixtures were obtained.

"The electrical fixtures, now being advertised, include new and special designs in keeping with the magnificence of the other features of the building."

The ornamentation everywhere especially in the frieze of the main exterior cornice contains motives derived from Spanish and Italian architectures. Over the frieze a wooden cornice projecting about



Ground Plan, Malacañang Executive Building.

four feet surrounds the main structure. It supports partly the sloping tile roof and emphasizes the Spanish influence. The balconies and railing in the second story are plain wrought iron work, such as may be seen nearly everywhere throughout Spain.

The ground floor of the building when completed will contain a Main Hall, Reception Room, Ante-rooms, Main office, the Governor-General's office, the Vice-Governor's office, the Secretary's office and the Clerks' office. The second floor will contain eight bed chambers and every one of them will be provided with all the modern comforts. The interior treatment of the various rooms will be of a refined simplicity lined with handsome native hardwood and richly decorated with artistically carved wood panels; each room depicting a kind of native hardwood.

When the building is wholly completed with its formal garden fully carried out, it is believed the Malacañang grounds will present a view of exceptional charm with the Executive Building majestically standing out beyond.

ECONOMIC POSSIBILITIES OF THE CALIRAYA RIVER WATERPOWER PROPOSITION.

Prepared by L. L. VINCENT, *Electrical and Mechanical Engineer.*

(For transmittal to His Excellency, the Governor-General, August, 1918.)

INTRODUCTION.

From time to time, during the last fifteen years, the subject of developing the water powers of the Caliraya River has been up. As far back as 1903, Governor Taft ordered the proposition investigated. In 1905 it was reported favorably upon, although with a somewhat mistaken idea of the dry season limitation of the proposition, and, in the opinion of the writer, with a rather excessive estimated cost of development. In 1914 the interests controlling the Manila Electric Railway and Light Co., obtained a franchise for the proposition under Act 2361. In 1916 an extension of time was obtained under Act 2560. And more recently the matter has been brought to the attention of His Excellency, the Governor-General, by Mr. W. H. Lawrence, who asked that partially completed plans for the hydraulic development be accepted as compliance with certain requirements of the franchise in respect to the submission of plans. It is thought therefore that a brief study of the economic possibilities of this project may possibly be of interest to His Excellency, at this time, and the following is prepared from such information as is readily available. The conclusions are based on a preliminary estimate, and the whole study should be taken with the understanding that its factor of dependability would be improved, were certain data substantiated by first hand investigation and were an estimate prepared in greater detail than it has been thought wise to undertake at this time. It will, however, serve to give a fair idea of the possibilities of this proposition.

POWER AVAILABLE.

This Bureau has on file stream gagings of the Caliraya River for two 2-year periods, first in 1904, 1905, and 1906, and again in 1911, 1912, and 1913. In May, 1912, a minimum flow of 12 second feet was observed. The average flow for the four months of minimum run-off was 40 second feet. The writer understands that a minimum flow of 11 second feet has been observed in this river. However, 1912, on the whole was a dry year, and the corresponding values given above may be taken as fairly representative of a minimum flow year. The proposed storage capacity amounts to 175,000,000 cubic feet. If the dry season is taken as 100 days this storage will supply 20 second feet average for the period, or the total available average supply will be 40+20=60 second feet.

The corresponding theoretical power will be

$$\frac{60\text{ (sec. ft.)} \times 62.5\text{ (lbs. per cu. ft.)} \times 780\text{ (ft. head)}}{550\text{ (ft. pounds per second)}} = 5{,}310\text{ water h. p.}$$

With an overall plant efficiency of 60 per cent, 3,200 horse power or approximately 2,400 kilowatts average power can be delivered in Manila. With the aid of the reservoirs, this of course can be delivered at such a rate, that is with such a peak value, as conditions may demand—and plant capacity is provided for.

POWER REQUIRED.

In the February 26, 1916, issue of the Electrical World, there appears an article on the subject of electrical service in Manila, which gives considerable data that was probably furnished by the J. G. White Companies. For twenty-six months, July, 1913, to August, 1915, inclusive, the average load was 2,200 kilowatts, the typical peak was 4,700 kilowatts and the maximum peak demand at any time was 5,130 kilowatts. It is known that the load has been growing rather rapidly the last two or three years. By hearsay, the writer understands that the typical peak is now around 6,000 kilowatts. By proportion the average load is therefore now probably around 2,800 kilowatts. Thus it will be seen that the development outlined, with its dry season continuous output capacity of 2,400 kilowatts, would fall short of the demand in years of minimum flow unless additional storage is provided, or a proposition of bringing over the Lamot River flow is carried out. In normal years there would be ample water, and it is not believed that it would be necessary to furnish auxiliary power more than two seasons out of a period of ten or twelve years, except as in an emergency capacity.

PERMISSIBLE COST OF THE POWER.

For the twenty-six month period referred to in the first preceding paragraph the annual production of power by the Manila Electric Railway & Light Co., was 21,789,900 kilowatt hours. The cost of coal at ₱10 per ton was given as $.00715 per kilowatt hour, which gives an annual coal bill of $155,797.50 or ₱311,595. It is understood that this company now pays ₱12 per ton for coal. Hence by proportion the same energy would cost, for fuel only, 12/10 of ₱311,595 or say ₱373,000. With the energy output increased in the ratio 6.5 the present annual coal bill is probably 6/5 of ₱373,000, or roughly ₱450,000. In normal years this would be entirely eliminated by a water power supply, not to mention the saving in oil and waste, general supplies, boiler feed water, maintenance, and depreciation incidental to the discontinuation of the operation of the steam plant. Labor and attendance is not mentioned here, because it is supposed that the company would hold the present steam plant always ready for emergency service. Personnel approximately equal to the force employed at present would be required to operate a water power plant and maintain the present plant for standby service, so that this item may be omitted as about equal in either case. Omitting the wage item from the classified operating expenses given for generation, the unit cost was $.00798 per kilowatt hour, which gave a total annual cost of generation of 21,789,900 by $.00798=$174,000 or ₱348,000, roughly. The present annual cost may be approximated by assuming that it has increased in the same proportion as the fuel bill or

$$\frac{450{,}000}{311{,}595} \times ₱348{,}000 = ₱503{,}000.$$

That is, in round figures, the local power company can afford to pay as much as one-half million pesos per year for a water power supply.

ESTIMATED COST OF THE PLANT.

A preliminary estimate of the cost of the hydro-electric system, based on the drawings submitted by Mr. Lawrence and extended to make the plant complete and ready to deliver current to the Manila system, amounts to ₱3,000,000. Unit costs were taken rather high so that if materials are obtainable at all, the plant might be built for that sum in the present abnormal times. If favorable construction conditions were encountered, the cost might fall below this figure. On the other hand, were obstacles encountered the cost might be considerably more. The estimate is made to include engineering, administration, organization and financing, and interest during a 2-year construction period. It covers a plant that would deliver a maximum of 9,000 kilowatts in Manila with the possibility of expanding this to 12,000 kilowatts by a comparatively small additional investment. The corresponding cost per kilowatt is $166, which lies well within the range of ordinary practical limits.

GROSS RETURN ON INVESTMENT.

The gross financial return on this investment, from the grantee's point of view, is of course that amount for which he can produce the same power by steam. This amounts to

$$\frac{500{,}000}{3{,}000{,}000} = 16.6 \text{ per cent}$$

on the capital. Against this must be charged certain operating and fixed costs which may be taken on a percentage basis as follow:

	Per cent.
Labor	1
Administration	¼
Oil, waste, etc	¼
Maintenance	1
Taxes and insurance	1
Depreciation	3½
Percentage tax under franchise	1½
Total	8½

NET RETURNS OF THE INVESTMENT.

This would leave a net return as interest on the investment of 8 per cent. In addition to this there would be the advantages of having a duplicate generating capacity and quite complete independence of the fuel market. When considered in conjunction with the fact that this plant is to be supplementary to, and in effect a part of the Manila system, which no doubt has been a profitable business throughout its existence, this return ought to be a sufficient inducement to attract capital.

Should the cost of the plant run up to four million pesos, the gross return would then be 12½ per cent and the net return but 4 per cent. This would hardly be an inducement for the investment of private capital. It may reasonably be taken as the minimum limit of return, however, and therefore the limit of the risk involved in the proposition as a business venture.

SUMMARY.

The gist of the matter may therefore be summed up thus:

1. The proposition is capable of furnishing ample power to meet the demands of the present Manila load in years of normal rainfall.
2. In dry years, probably two out of a period of ten or twelve years, a small amount of auxiliary power would be required.
3. The local power company can afford to pay ₱500,000 per year for this power.
4. It is estimated that the plant can be built for ₱3,000,000.
5. The gross return on the investment would therefore be 16.6 per cent.
6. Operation and fixed investment costs would consume about 8.6 per cent leaving about 8 per cent as interest.

OTHER ECONOMIC CONSIDERATIONS.

From the point of view of the Government, there ought to be other and important considerations that make the development of this project desirable. This year not less than ₱450,000 will be sent to Japan for coal. The production of this coal occupies labor and shipping which the world needs for other purposes. Were this plant built, this ₱450,000 would go to pay for labor, taxes, local operating costs, interest on considerable amounts of capital expended within the country, and as interest to the country whence the capital is supplied. Financially, it is to the interest of the country at large, that this project should be developed.

Manila is now absolutely dependent upon shipping for her light and power. There is probably never more than a month's supply of coal on hand. Should the country become at any time embroiled with any sea power the supply would probably be cut off. This would probably occur even if the known Philippine coal fields were developed and were furnishing the supply. Were this plant in operation the power supply would at least be safe until the country were actually invaded.

Every progressive country should develop at least the most economical of its water powers. Such developments cannot but react to the good of the country. Let us suppose that an error were made in estimating the cost of this plant; that a consequent increased unit cost of generation above that of the steam plant were had. From the private owners point of view that is prohibitive. It is bad business. From the broader view of national interests it is only a matter of paying increased rates for home production, a tribute to the country's own industry and economical independence; the equivalent of the individual taking money from one pocket and putting it into the other in payment of services he has rendered himself. After all, the margin between 1.8 cents as a cost of production and a 30-cent base rate as a price of disposal, or 9.37 cents as an average revenue per kilowatt hour is a rather large margin and probably affords some leeway for possible errors in making estimates. These figures are quoted from the data referred to hereinbefore. It is hardly a case in which financial calamity must result from a lack of the nicest exactness in foreseeing the cost of the plant. It is believed the government could afford to go to some extremes in encouraging this waterpower development. So far as the writer can see there is no reasonable risk of any great financial losses, and as a matter of fact it promises to be financially profitable. As opposed to the extension of the local steam plant, the proposition is probably the more economical.

It has been known since 1905 that this project is financially feasible. Had it been built in normal times it no doubt would have been a very profitable investment. It is probable that the local power people have permitted political conditions to have a deterrent effect in the past much greater than they would care to admit. Now, of course, there is probably reason enough for postponing the matter until the present crisis in the war has passed. However, it is the opinion of the writer that as soon as there is any tendency of conditions in the world's markets toward the normal, the Government might profitably insist on this, or some other project, if one can be found that promises to be better, being put into effect. The writer believes this is true even to the extent that if necessary the plant should be built under government ownership and the local company required to buy and use the power at a reasonable cost. The grantee may feel that there is a certain element of chance in this investment—an element of chance that the Government does not need to consider at all. Consequently, and for other reasons of policy, he might be willing and glad to accept such a solution of the proposition without regard to the legal possibilities of the situation. The writer will not attempt to go into the latter phase of the question, but there are certain passages in Act 2361 which suggest that there is some proviso in the local companies franchise whereby the city of Manila could acquire the local plant. Such a situation might be useful in inducing the grantee to consider the welfare of the country at large, rather than any private interests that might be opposed and likely to be affected thereby.

A BRIEF REVIEW OF ROAD DEVELOPMENT IN THE UNITED STATES.

By N. S. SALEEBY, *District Engineer, Cagayan, P. I.*

Roads are the offspring of civilization and have become the chief factor for its advancement. Their importance has been recognized since the early days of Egypt. Man's inquisitive character and his desire for intercourse with his fellows, the necessity of provisions in the time of scarcity, the desire to gratify one's fancy with the products of other localities and, as we come through history to the days of the Romans, the necessity of roads for military purpose—these are few of the early motives for road building.

Herodotus speaks of the Egyptian road built under King Cheop by a force of one thousand men working for ten years. Stropo informs us of the pavement in the city of Babylon 2,000 years B. C. and of the three great highways that ran from there to Suiza, Echatann, and Sardiss. History records as well the great highway that ran from Babylon to Memphis, passing the great cities of Ninevah, Palmyra, Damascus, and Antioch, and the great care bestowed upon road construction by the Senate of Athens, the Government of

Lacedaemon, Thebes and other states of Greece as to the monumental highways of the Romans of which they had 372 roads, comprising fifty-three thousand miles. The Carthagenians deserve the first credit, because it was the Carthagenians from whom the Romans learned the method of systematic and scientific road building.

In constructing these roads, two furrows were dug showing the roadbed width. The material between these furrows was dug out to a fairly solid foundation. Sand was then placed to a certain height and thoroughly compacted. Upon this four layers of masonry were built:

1. The Statum: 10–20 inches thick, built of large flat stones laid in lime mortar.
2. The Rudus: about 9 inches thick, of rubble masonry.
3. The Nucleus: a thickness of 6 inches of fragments of brick, stone, and pottery set in lime mortar.
4. The Suma Crusta: a 6-inch layer of stones, closely jointed and fitted with the utmost nicety.

In Peru the Incas built great roads during the dark ages. England and France started a revival of road construction along the middle of the 18th century, and shortly afterwards the chief cities of Europe followed their example.

We come now to American highways and their development. Early settlers brought over with them nothing of value in road building, due to the low state to which roads had been brought during the dark ages. Further than that, among the other causes for slow progress in highway improvement in the United States might be enumerated the following:

1. The excellence of railroad and water transportation.
2. Dispersion of the people over large areas in their search for desirable localities of residence.
3. Want of appreciation of good roads and fear of increased taxation on the part of the rural population.

As early as 1653 Boston had a street paved with pebbles. When Ward visited Boston about that time, he wrote, "The buildings are like their women, being neat and handsome and their streets, like the hearts of the male inhabitants, paved with pebbles."

In 1657, New York had Browel street paved and that street is known to this day as "stone" street. Philadelphia, after an accident in 1719, raised by subscription enough money to pave the street on which the accident took place with pebble stones.

All the information we have, goes to show that there were no paved roads in the United States outside of cities and towns till about 1800, when the systems of Tresaguet, Telford, and McAdam came out. At the beginning of this period, the people followed the mother country in construction and in the plan of building roads, through the instrumentality of chartered corporations. As a result of this, we have what is known even today as the "turnpikes." The Wilderness turnpike, through the Shenandoah Valley, Virginia, westward by way of the waters of the upper Tennessee and Cumberland gap to central Kentucky, is an example of this. In Virginia, Kentucky, and Tennessee, a good system of macadam roads developed with great profits to the road corporations and quite an increase in land tillage and consequent wealth. Even now, New England has a dozen or so of these roads radiating from Boston. But before the Civil War many of these highways were turned over to the free use of the public. This brings us to what is known as the Good Road Movement born in Missouri in 1892. This movement resulted in the National Road Convention held in Chicago in 1900 in which 38 states were represented. A Committee of 17 was selected to interest the Government, on the one hand, and to bring the matter before the public in such a way as to arouse their enthusiasm. This Committee interviewed President McKinley and obtained the coöperation of the directors of the Office of Public Roads. Their steps were next directed to the railroads. Mr. Fish of the Illinois Central was approached. He agreed to let them have a demonstration train of fifteen cars for three months, at a cost to the railroad of from forty to fifty thousand dollars. They went with this train from Chicago to New Orleans. States were asked to defray local expenses, and under the direction of expert engineers loaned by the Government and a few more hired ones, they built object-lesson roads. As a result of this, the states through which they passed began to arrange for taxation at 1 to 3 mills on the dollar valuation, and issue bonds for large amounts to be spent in the improvement of common roads.

Soon after that, a second train was sent over the Lake Shore Road and a third one went through the Southern states. The Southern Railway equipped the train and fed the men at a cost of $80,000. At Charlottesville, Virginia, they held a great convention which resulted in the building of a portion of the Jefferson Memorial Road. Still another train was sent over the Great Northern Railroad, with equally successful results.

As interest in good roads increased, people began to realize that 1 to 3 mills taxation on the dollar was not enough and a higher taxation would be quite a burden. This induced them to seek State aid and finally Government aid. Gradually, as traffic increased and changed in character, roads and pavements took similar strides, and the problem of choosing a pavement which would be most economical became a complicated one.

RECENT STUDIES OF ACTUAL INTEREST.

EDITOR'S NOTE.—The following articles have a later date than our present issue of the Quarterly Bulletin but, having been uttered at the time when this late number was being put into press, and espousing as they do the same identical views, that, on the one hand, are discussed in our present editorial, and, on the other, in the special article on "A Brief Review of Road Development in the United States" by N. S. Saleeby, we beg leave to present them to our readers, feeling assured that for the above reasons we may be pardoned for this inconsistency.

These articles, namely, "Representative Aquino's Salary Bill for Engineers," by J. V. Bagtas, District Engineer of Laguna, "Construction of Vicinal or Inter-Municipal Roads," by Valeriano Segura, Civil Engineer, Cebu, and "Attitude of District Engineers Towards Other Officials and the General Public," by L. T. Clark, District Engineer of Cebu, were read at the 7th Annual Conference of District Engineers held February 5-12, 1920, in Manila, P. I.

I. REPRESENTATIVE AQUINO'S SALARY BILL FOR ENGINEERS.

By J. V. BAGTAS, *District Engineer, Laguna, P. I.*

In discussing Representative Aquino's salary bill for engineers for the Bureau of Public Works as published in the November 18, 1919, issue of the Manila Daily Bulletin, I shall here give brief remarks.

Before going further into the subject allow me to discuss the value of the engineering profession. The civil engineer is characterized as "the third leg of the tripod on which rests the modern industrial civilization." The civil engineer, according to the President of the American Society of Civil Engineers, immediately becomes useful to the society and is constantly originating other wants by the improvements he introduces. He is creative; his duty consists in designing, arranging, and building structures or machines. The engineer is the prime factor in the growth of any country and could not by any possibility be dispensed with. The work of the engineer is the foundation on which rests the growth of any nation, not only physically but financially. "We are not an organization which threatens to pull down and wreck or destroy what we have built but an educational organization and hope to get the necessary recognition of our rights." The engineer is designing and building many a monument which will endure for ages as a testimonial of his proficiency and skill, and we need not go back many years to find members who have won the highest engineering distinction and whose names are engraved on the enduring pages of history.

With this value of the engineer is he appreciated? Does the general public and this government recognize the value of the engineering profession? There is a regrettable lack of appreciation and recognition of the engineering profession not only in the matter of compensation but also in the administration of public affairs! This is a problem which has confronted and even now is confronting the engineers of the United States and undoubtedly this is the very problem now confronting the engineers of the Philippine Islands where civil engineering is still a profession unrecognized and degraded in comparison with other professions such as the lawyer and the physician.

There must be certain underlying causes why the engineering profession is not appreciated and they are according to Mr. Sparrow of Chicago as follows:

"Inadequate compensation; lack of organization; lack of initiative in public affairs; lack of publicity concerning the engineer and his worth and his relation to the better health, comfort and welfare of the community; lack of proper public regulation in the form of licensing; improper application of the definition of the term 'engineer,' and lack of general education and inability to speak well."

The above are the prime causes of the lack of appreciation of engineers throughout the world and emphatically so of engineers in the Philippine Islands. It is up to us, as a class, to study the above defects and strive hard to secure a remedy. At present there is a general feeling of unrest and dissatisfaction among engineers in the Islands especially among those in the Government service for the simple reasons of poor pay and lack of proper recognition. Undoubtedly the removal of one of these causes would gradually also eliminate the other. Give the engineer the proper pay and he will be duly recognized. It is a well known fact that no other thing has contributed so much to the degradation of the engineering profession and no other factor has affected the prestige of the engineers as the small financial returns for the services rendered. We must not forget that the public knows little or nothing of the amount of training, difficulties and hardship that one has to go through to qualify himself as an engineer. The public is ignorant of the nature of the problems that daily confront the engineer and the sound judgment, skill and initiative he must employ in order to solve these problems. The public cannot appreciate, not knowing these circunmstances, the importance of the engineer in terms of his attainments and qualifications. It must be evident that never will the engineer, as a class, occupy the same position in the community as the physicians or lawyers until they raise the value of their services to the same extent at least as that of the men of other professions. Is it the political cloud that has cast a shadow over us so that our practical ability does not get the proper recognition in our government circles; or is it our modest indifferent disposition of being satisfied with our present, low, status? Engineers will not secure proper social recognition until they triumph in solving the difficult problem of securing the rightful compensation for their labor.

That the engineers are underpaid, nobody can deny. A civil engineer after four years of college training, of hard and conscientious preparation for the struggle of life, after four years of solid and difficult study, he comes down to seek an employment in the Government service only to receive a poor, meagre entrance salary of ₱100 a month which is barely enough to keep him standing on his own feet and meet the prime necessities of life and society. Statistics show that in the Philippines today carpenters and trained masons could earn as much as ₱5 per day for their services. Is the civil engineer justified in receiving a hundred pesos entrance salary, a salary below the level of the carpenters' or the masons'? I believe that most of us who are in the engineering profession are in the game because we love it. We have no longings for "royal salaries" at the expense of our over-burdened tax-payers. We are really willing to devote our lives and services to humanity, but, first of all, we have to live to do it. How can engineers progress when they cannot even afford to buy books or any engineering magazines which are of essential necessity? What sort of work can we expect from engineers with righteous discontent in their hearts, knowing that their families, on account of their meagre salaries, are suffering hardships and misery? Certainly I am of the opinion that engineers should be given better salaries in the Philippine Islands to meet the high cost of living and extra expenses for social activities in which the engineer should and must necessarily take part to be in close touch with the different elements of life, and thus render higher, better and more beneficial service to mankind.

Everybody is aware of the fact that the cost of living now is getting higher and higher and is bound to remain very much higher in direct proportion to the increased income of labor, and probably will never come down to the level of pre-war days. Manufacturers will get higher income by charging bigger prices for their goods, the farmer will get higher profits by selling his products at increased prices, in this event what is to become of the salaried technical engineers whose compensation has remained stationary for the last five years while the cost of living has increased three or fourfold? In the face of these conditions how is the engineer going to exist? Is the engineer the only victim of circumstances at whose expense the other classes will improve their material conditions, since he will have to pay the increased cost of commodities while his salary or income remains in the same level? Some remedy ought to be applied to improve these conditions, and I sincerely believe, only one feasible, practical remedy is recommendable, that is, to raise the standard minimum salary schedule to be paid for various degrees and grades for engineering work. In the proposed bill presented by Representative Aquino before the House of Representatives, designating the salaries from Junior Civil Engineer up to the Director of Public Works, I am of the opinion, and the class of engineers throughout the Islands is undoubtedly with me, that the proposed measure is too low and the profession is underpaid all the way down the line.

REPRESENTATIVE AQUINO'S PROPOSED SALARY BILL FOR ENGINEERS IN THE BUREAU OF PUBLIC WORKS.

Director of Public Works	₱7,200.00
Chief Constructing Engineer	6,240.00
Chief Designing Engineer	6,240.00
Two Consulting Architects (each)	6,000.00
Junior Civil Engineer for 5 years service	1,500.00–2,400.00
Assistant Civil Engineer for 3 years	2,400.00–3,600.00
After 8 years, Civil Engineer	3,600.00–6,000.00

As a matter of comparison I shall quote the existing standard salary in the United States, as approved by the American Association of Engineers:

Chief Engineer In charge of all construction and maintenance work of the department, acting as chief executive officer.	$8,000.00	to	$15,000.00
Engineer of construction	6,000.00	to	10,000.00
Designing Engineer	5,000.00	to	6,000.00
District Engineer	5,000.00	to	8,000.00
First Assistant Engineer	3,600.00	to	5,000.00
Junior Assistant Engineer	2,400.00	to	4,000.00

With the above schedule of salaries it could readily be seen that engineers in the Philippines are very much underpaid and it is to our Government to realize the very poor financial returns that Filipino engineers get from their profession, thus creating a spirit of discontent on the part of the new as well as experienced engineers and finally resulting in leaving the Government service. To meet local conditions in the Islands the following schedule is advocated for civil engineers and officials of the Bureau of Public Works:

Director of Public Works			₱12,000.00
Chief Constructing Engineer			10,000.00
Chief Designing Engineer			10,000.00
Two Consulting Architects (each)			9,000.00
Junior Civil Engineer for two years service	2,160.00	to	3,000.00
Assistant Civil Engineer after three years service	3,000.00	to	4,500.00
Civil Engineer after five years experience	4,500.00	to	9,000.00

In conclusion let us one and all convince the public and our Legislature of the value of the engineering profession; let us strive hard to secure the proper and rightful recognition of our rights and privileges and through a series of advertisements convey to the public the idea of the value of the services being rendered by the engineers to mankind. Brothers of the profession, we should rise to the occasion by demanding our rights to a proper and legitimate recognition by the people in general and our Legislature in particular, to our social and financial betterment with a view to perpetuate a necessary standard of efficiency in the engineering profession.

II. CONSTRUCTION OF VICINAL OR INTER-MUNICIPAL ROADS.

ABUTTING PROPERTY TO PAY ENTIRE COST OR THE MUNICIPALITY AND ABUTTING PROPERTY OWNERS TO PAY HALF AND HALF.

By VALERIANO SEGURA, C. E., *Assoc. M. Am. Soc. C. E.*

In this short paper the method of financing road improvements and the organization which handles said improvements in other countries are cited which may offer a solution to the financial difficulty which is met with at present in the construction of inter-municipal or vicinal roads in the Philippines. Faulty legislation regarding public works improvements in this country, especially concerning road construction, is so well established that only another legislation can change the practice.

Road constructions in some of the provinces have already reached a limit. On account of the present method of financing road improvements, the authorities are being confronted with the question of how fund can be obtained in order that further construction can be undertaken. It may be possible that some knowledge of conditions existing in other countries in regards to road improvements may furnish us some ideas from which we may base a reform to our system.

There is no doubt that the construction of more roads in the Philippines, in addition to what we have already completed, will be a further step forward in the advancement of our progress. Good roads are essential to the development of the agricultural, mining, forest and other resources of a country; indispensable to the growth of manufactures, and as a medium of spreading education and enlightenment of its citizens.

In the United States, for example, road improvements were undertaken almost simultaneously with the organization of the Government. The first step towards highway improvement in the United States was the construction of roads by private corporations. The National Government then followed by appropriating funds for the construction of National highways. Later on both of these methods were abandoned and the whole responsibility for improving and maintaining the highways was left entirely to the local authorities in the countries throughout the various States. Under this system the State contributed nothing to the cause either in money or supervision. The country or town relied only on its local revenues, consisting mainly of statute labor for prosecuting the work. For some time this method was employed but later on disadvantages have been found in the form of inadequate revenues and it failed to insure skilled supervision and practically precludes the construction of roads of a permanent character. No coördination and standardization has been accomplished as each county official went on ahead with his method of construction independent of the needs of the nearby counties. The idea of having State supervision was later on conceived and State aid was given to these improvements and the tendency has been the extension of the power of the State Highway Department and consequent increase in State appropriations.

In Cochin China two systems of roads are constructed. The first system comprises the colonial roads which are constructed and maintained directly by the public works department. Other roads are constructed and maintained in each of the provinces by an agent of the public works department under the supervision of the administrative chiefs of the province. The Governor-General of Indo-China, the Governor of Cochin China, and the administrative chiefs of the provinces, assisted by the department of public works have authority over all roads, streets, etc., which are declared and form part of the public domain. There, as here in the Philippines, maintenance takes precedence over construction. The former being provided in the budget under the head of "compulsory expenses" and the latter under "optional expenses" which varies with the available sources and supply of labor. "Most of the roads of Cochin China have been constructed by private contractors, under the supervision of the public works department. Each native under 55 years of age is required to give five days of gratuitous work each year, or its equivalent in money, and the use of this labor enables the Government to carry on most of its road works without expending any money for labor."

Previous to the American occupation, there had been considerable road improvements in the Philippines, the evidence of which are still visible to the present time. Most of the work was done originally on the initiative of religious orders but later on the control of all public highways was placed in the hands of the "capitan-general" as chief of the bureau of public works. For the rapid prosecution of the work a method similar to the one in Cochin China was practised in the way of requiring compulsory gratuitous labor or its equivalent. At that time all male Filipinos were required to work on the road for fifteen days each year, or its equivalent in cash. No provision for maintenance was made except that the barrio tenientes were supposed to keep the section of the road within the jurisdiction of his barrio passable by carts which was all the requirements at that time. Upon his failure in the discharge of this commission a severe penalty of either imprisonment or fine was administered. This method, of course, is impractical and the result was the rapid deterioration of these roads.

As in the United States, the Philippine Government realized the importance of centralized control of road improvements throughout the Archipelago. The Bureau of Public Works was reorganized and was given complete supervision of all Insular, provincial and inter-provincial road construction and maintenance. A definite road policy was at once adopted which consists in the construction and maintenance of main trunk roads and their ramifications to important towns. Certain limitation as to permissible maximum grade and length of curve was established and standard cross-sections adopted. An extensive road construction and maintenance program was immediately worked out and there has been the tendency of centralized control which is conducive to a uniform and effective supervision.

In order to finance this extensive road construction and maintenance program there has been created what is known as the Road and Bridge Fund. This fund is expended in the provinces where collection was made for the construction and maintenance of its roads and bridges. In addition to this the Insular Government, by different acts of the Legislature, provides special and regular yearly allotments to the different provinces as aid for further construction and maintenance.

The standard cross-sections adopted by the Bureau of Public Works for all provincial roads call for a 15 meter right-of-way with a metalled width of from 3 meters to 5 meters. The thickness of the surfacing provided was 15 centimeters. These requirements, however, were evolved without foreseeing the tremendous amount of traffic that developed within a short time. The lack of proper traffic regulations previous to the enactment of the present automobile law also was responsible for the rapid deterioration of the first class roads. Thus the fund that could have been used in the construction of new roads were employed in the reconstruction of roads already built. Under this condition and with the present method of obtaining revenues for road improvements, it can be seen that very little can be accomplished. Evidence in a number of provinces has already shown that with the present means of financing construction no more new roads can be built. The total road and bridge fund per year in some provinces cannot even cover the cost of the proper maintenance of the first class roads in the same year. Some means have to be devised in order that more inter-municipal roads can be constructed to supply the demands for this very important public improvement, upon which depends the rapid development of the natural resources of this country.

The revenue of some municipalities under present method of taxation is not even sufficient to finance local improvements. Municipal officials in most cases look upon the provincial road and bridge fund as the only source from which they can obtain fund for road construction. I believe there is a provision in the Administrative Code requiring the expenditure of 30 per cent of the total road and bridge fund collected in a municipality for expenditure in that municipality, but I also believe that very few municipalities are benefitted by this provision. Invariably municipal officials go to the provincial board and request that certain roads be built or reconstructed.

Upon failure to get the desired aid, one of the only two ways are left open for them to solve this difficulty, namely, go without the road or raise fund by voluntary contribution. Spasmodic efforts in a number of municipalities have been tried in the construction of vicinal roads by voluntary labor. Usually there is considerable enthusiasm during the first few days among the people, but this interest usually subsides as the days pass on. Generally these roads are devoid of any provision for its maintenance. Consequently rapid deterioration is the result. This scheme of road improvement can not be considered practical.

The question of whether the abutting property owners should be required to pay for the entire cost of construction, or the municipality and the abutting property owners to pay half and half is one which has its advantages and disadvantages. I presume that in places where the land is highly productive like those in Negros and Pangasinan there is no doubt that the abutting property owners would be willing to pay for a road that would benefit themselves. However, as soon as a good road is constructed entirely of private funds it ceases to be a public improvement unless its use is entirely opened to the public. There are many roads that have been constructed by private funds but usually they are not properly maintained and a condition develops which is far from being desirable. As a matter of fact, inter-municipal roads usually pass through tracts of land either poorly cultivated or completely abandoned, or land which is of no value in an agricultural way. In this case it is very doubtful that the owner of this land would be willing to pay for a road that would be of no value to him.

To require the abutting property owners to pay half of the cost of construction would require legislation. There is nothing in the present Philippine laws which provides for this method of financing public improvements. The people have been so long accustomed to look upon the Government as the only source of fund for public purposes. A number of cases are on record, however, where public spirited citizens have contributed financially in the completion of public improvements. The cases are few but usually there are other reasons than simple philanthropy which induced the interested party in such a venture. Usually a land owner will be more than willing to share with the government in the cost of constructing a road where such road will give him a number of benefits.

Supposing that the cost of construction has been agreed upon, either by legislation or otherwise, to be born half by the government and half by the abutting property owners; the question of the amount that each owner should pay will at once arise. A number of ways may be suggested from which the proportionate charges can be made. The length of frontage on the road can be used as a basis; or the area of the lot having one side on the road or by the amount of assessed valuation of the abutting property. Possibly the last method will prove advisable, the value of the land being the index of its productiveness to the owner. This method, however, will prove helpful only where the land have been duly assessed in value. In cases where no assessment has been made it may be necessary that an agreement with the abutting property owners can be had at the time that the final road survey is made.

As stated before in this paper only another legislation can change the present method of financing road construction and maintenance in the Philippines. There is no question that there is a great demand for more vicinal roads throughout the provinces which cannot at present be constructed on account of the limited funds. To create funds by the issue of bonds is one of the solutions to this problem. However, this cannot be possible at the present time due partly to the Jones Law and partly to the present political organizations of the Provincial and Municipal governments.

In view of these conditions I believe that the enactment of a new law which would empower the local political governments to create funds for public improvements other than by the present method is advisable. I believe in a legislation requiring owners to pay half of the cost of construction and maintenance of vicinal roads in proportion to the value of the land. And I believe that the construction and maintenance of such roads must be under the supervision of the Bureau of Public Works.

III. ATTITUDE OF DISTRICT ENGINEERS TOWARDS OTHER OFFICIALS AND THE GENERAL PUBLIC.

By L. T. Clark, *District Engineer, Cebu, P. I.*

When a company or an individual doing business decides to sell out to another organization there is generally included in the terms of sale an item called reputation and "good will". Now this thing called "good will" means the friendly attitude of the people with whom the company has been doing business. If the company did not have the good will or confidence, or friendship of its clientele its success would be limited. You will often notice two firms in the same town engaged in selling the same line of goods. One is prosperous, the other is not. Their goods are relatively of about equal merit. One is inclined to wonder at the different degree of success obtained by these firms. Nine times out of ten, however, other things being equal or nearly so, this is accounted for by the personality or personalities of the men of the two organizations,—the man of the successful company being far more popular personally than the man of the rival concern. Personal popularity is a recognized business asset. The possession or lack of it often spells success or failure in a business man's career.

This same thing applies to a considerable extent to a District Engineer. I personally have known cases where a District Engineer did good work but his personal unpopularity with either other officials or the public or both blinded them to a great extent to his good work and his administration was generally considered a failure which registers a black mark against the man's record and causes adverse criticism of the Bureau.

Therefore, it seems that a District Engineer should use care to gain the good will of his brother officials and the general public whose money he is spending. Generally speaking this is not a difficult proposition. Man is a gregarious and friendly animal. He does not, as a rule, show enmity without a real or fancied cause. If a District Engineer simply uses care not to give anyone a real or imaginary cause for grievance he will soon gain the good will of the people among whom he is working.

I have noticed that in many cases the grievances were more fancied than real but nevertheless the District Engineer was originally somewhat to blame for not using sufficient care in making himself entirely clear to the person who had the grievance.

One of the faults I have noticed with many engineers is that they stand too much upon their dignity in small matters. For example they will resent receiving an indorsement from some other official—say the Treasurer or Superintendent of Schools—beginning. "Respectfully transmitted" instead of "Respectfully forwarded" or if some other official asks or sends word to them to come to his office. Sometimes they reply "you come to my office." Sometimes the boy carrying the message adds more to it thus arousing resentment on the part of the other official. I have known an Engineer and Treasurer with offices in the same building who became involved in an altercation over an affair of this kind and they would sit almost daily and write each other long and acrimonious letters which led to nowhere and resulted in much wasted effort and lost time which they could have spent much more advantageously otherwise. Now I do not mean to imply that the office of District Engineer carries no dignity with it. It does; but the District Engineer is not going to maintain that dignity by taking notice of such small matters as just mentioned. When a man takes notice of such picayunish things it shows that he apparently lacks confidence himself in the dignity of his office and that he feels it is incumbent upon him to forcibly attract people's attention to it. He should be so sure of his position that he can act as if he could afford not to notice trivial infractions of the dignity attached to it. The dignity of a District Engineer's position while not affected by the things mentioned above—unless he takes cognizance of them—can be injured in a number of ways some of which I will mention. A District Engineer can be—and generally is—criticised if he does not live in a house that compares favorably with those of other officials, if he does not dress his family and himself equally as well as the leading families of the town, if he has few or no servants and lives poorly, if he fails to pay his bills promptly when due, if his contribution to public receptions are no larger than some of his clerks and foremen or if he is too obsequious with prominent men.

Furthermore a District Engineer often appears to think it is necessary, in order to maintain his dignity, to be abrupt with his subordinates, to refuse to listen to their complaints, to belittle their advice or unwilling to give them a chance to explain their grievances or to take time personally to adjust same. Some District Engineers make the bad mistake of treating all their subordinates as if they were muchachos. Such treatment is sure to kill loyalty and an engineer, to obtain success, must have loyal support from his organization. Do not think because a man is a foreman that you know more than he does concerning everything. The chances are the foreman has devoted considerable study to the project under him and knows more about the details of that particular piece of work than the engineer. Personally I have often received useful suggestions from foremen and I always encourage them to express their views. Also if you do adopt the foreman's ideas do not fail to see that he gets the credit for them. In dealing with his men a District Engineer should remember that they are human beings and have equal rights to encumber the earth as he has. On the other hand a District Engineer should keep the same fact in mind as to himself when he is in the company of prominent men or his official superiors. He should show them the usual courtesy and consideration due from one gentleman to another and also the respect due their position but nothing further is required.

A District Engineer should enter into all affairs of a public or semi-official nature and contribute as much as other officials of his position and salary, should be willing to serve on committees and should attend all official functions. By thus identifying himself with the local social life and showing he is willing to do his share he will make a favorable impression on his fellow townsmen and gain their confidence in his ability to handle his public duties.

Also an engineer should be tolerant and non-partisan. If he is criticised by those who differ from him in various matters of appropriations or how certain projects should be handled it will not gain him anything to lose his temper and abuse those whose views conflict with his. By being patient and carefully explaining in detail his views he will gain his point 9 times out of 10. That is, provided of course, he is right and an engineer, above all things, must be sure he is right and can prove it before expressing his views or being drawn into a discussion with other officials.

Furthermore do not assume an air of superiority in explaining technical question that may be put to you. On no account refuse—as I have known to happen in a couple of casses—to give information to members of the Provincial Board and Municipal Councils, Senators or Representatives when they ask for it. An engineer is spending the people's money and the officials mentioned above are the people's representatives and have a right to know every detail of what is being done and they have a perfect right to criticise anything they think is wrong. An engineer is generally the gainer by inviting the attention of municipal and provincial officials to different projects in which they are interested. He is the gainer because by so doing he stimulates their interests, gains their active coöperation and sometimes receives useful suggestions.

Above I spoke about the necessity of an engineer, gaining and keeping the loyalty of his men. A man who is not loyal himself can not as a rule inspire loyalty in others. Therefore, it is incumbent upon each and every engineer to be loyal to his Bureau. Formerly we had a very great degree of loyalty. I have seen a case where two men engaged in a fist fight over the relative merits of their respective Bureaus. This of course is carrying the matter to extremes but nevertheless a little of that old spirit is a good thing and an engineer should stand up for his Bureau in both public and private life. Any time the Bureau is criticised stand up and defend it. Some engineers are disloyal without meaning to be so. For example sometimes when questioned by a member of the Board as to why a certain project has not been started they will answer: "It's the Bureau's fault, they have not sent the plans down although I wrote for them six months ago." The statement may be true but it need not be expressed in that manner. How much better to say: "The Bureau is trying to get the plans out but they are so short-handed and over-worked at present that they have not as yet been able to prepare them. I am expecting them daily now and will start work as soon as they are received."

Passing the buck or knocking the Bureau are only a weak man's way of side-stepping responsibility. It is also a reflection on himself that he continues in the employ of an organization which his remarks show he considers inefficient.

There is one point more that I would like to bring up and that is the necessity of making a record of various orders and conversations. On important works instruction should be given in writing and carbon copy retained by the Engineer in either the official or his personal files. Also it is a good point to make notes of important conversation that may be referred to later. Such notes should of course be made at the time of the conversation when the matter is fresh in your mind. There is nothing like documentary evidence to prove what was said and done should it ever be necessary to do so at some subsequent date.

PERSONAL NEWS.

Mr. C. V. Powers, Acting Constructing Engineer of this bureau resigned effective January 6, 1919 to engage in private business in Manila as engineer and contractor for local and provincial construction work. He was succeeded by Mr. N. R. Baugh, formerly District Engineer of Laguna province.

Mr. A. W. Austin, formerly district engineer of Nueva Ecija province, was granted accrued leave of absence effective October 30, 1918 to visit the United States. He died in the United States January 20, 1919, while on leave.

Mr. Claude Russell, formerly Director of Public Works, P. I., after having served in the United States Army during the great European War, retired from the service of this Bureau on March 6, 1919, to assume the managership of the National Coal Development Company, Manila, a semi-government enterprise.

PROJECT NOTES BY DISTRICT ENGINEERS.

ABRA.—The ten kilometers of subgrade work on the Bucay–Peñarubia Road has been completed except for about 100 lineal meters which is solid rock. The first course of metalling has been nearly finished including 50 per cent of the second course.

Work has been started on the new Provincial High School Building in Bangued.

The subgrade work on the Bangued–Tañgadan Road has been completed with the exception of kilometer No. 24, also the first course of metalling has been placed on all of the kilometers except the one above mentioned. Four wooden temporary bridges are being constructed. It is expected that the road will be open for traffic on or about December 31st, 1919. More appropriations will have to be made next year for permanent structures.

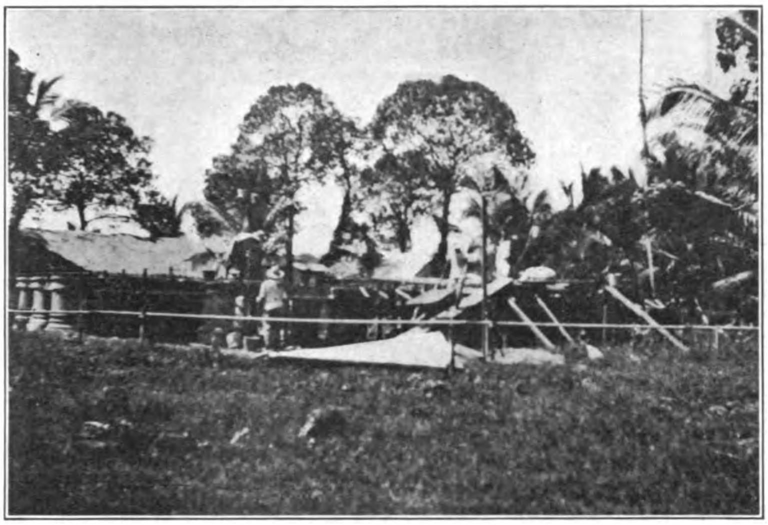
The subgrade work on the Tayum–Lagañgilang Road is practically finished. This stretch constitutes 5.5 kilometers. Work in this project will have to be stopped when the subgrade work is finished on account of not having enough funds.

AMBURAYAN, SUB-PROVINCE.—The Tagudin–North section of road is progressing nicely. At present there are about three kilometers of road finished, and also two reinforced concrete bridges are being constructed on this section. This section of road will be all completed by June 30th, 1919, as far as the section north of the town is concerned.

AGUSAN.—The subgrade construction of Butuan–Cabadbaran Road having been completed since last year, the only works left in this project are the construction of culverts and bridges and the hauling of gravel for surfacing purposes. The construction of bridges is now going on very satisfactorily. Difficulty is experienced in the hauling of gravel. The nearest source is from the Tagibu River, a distance of about 2 kilometers from Km. 7. As there are only 2.5 kilometers of track the gravel has to be relayed for distribution from the cars by bull-carts. A 1-ton Ford truck is also employed in hauling gravels from Km. 7 to the different sections of the road.

About 5½ kilometers of third class roads were completed on the Butuan–Nasipit Road project. This work was mostly done by the Lanao Moros on the "paquiao" system. About 200 Moros were working daily on the road during the last quarter. The rates of from ₱1 to ₱2.25 per lineal meter were paid for clearing, ditching, and constructing subgrade, depending upon the height of fill. The completed road passes through about 4 kilometers of forest and 1½ kilometers of coconut groves and cogon fields. The work on this project will have to be stopped very soon, however, for lack of funds.

The construction of Butuan Hospital is going on very satisfactorily. Nearly all concrete works are completed. All the brackets, plates and false rafters are set in place. All doors, roof trusses and shelled windows are also ready.



Construction of Butuan Hospital, Agusan. Finished concrete posts can be clearly seen on the left side. The first floor is now being poured in.

Considerable work has been done in the filling of the Butuan school ground. About 1,000 cubic meters of soil were delivered on the site already. At present there is no available ground where children could play their group games, as nearly all the grounds near the schoolhouse are low and swampy. At this rate of progress it is expected to have this ground ready before the beginning of next school year.

While there are several flowing wells in Butuan, most of the people have to depend on rain water for drinking purposes as the water in the artesian wells is too salty to drink. For this purpose the Provincial Board has assigned the sum of ₱2,600 for the construction of some concrete water tanks. The form for a 3,000-gallon tank is now completed and the construction will be started soon.

The construction of the Cabadbaran–Lake Mainit Road will be started very soon. As there is only ₱6,000 available for this project the people along the proposed road have promised to work without pay, provided the government will furnish them subsistence.

Four important construction projects will be undertaken in the near future: the extension of Butuan Primary School, the Agusan Agricultural School, the provincial bodega, and the Cabadbaran Intermediate School. Some of the materials for the first three projects are already received. It is very probable that the last project will be done by contract.

ALBAY.—Damages caused by the typhoon of December 25, 1918, to the various provincial buildings were repaired during January. All the roads were again made passable and the top course stone and binder which were washed out have been replaced.

The subgrade of the Albay–Sorsogon Road is finished to kilometer post 18 and culverts and pipe culverts constructed to kilometer 14. The remaining 2½ kilometers of subgrade are now under construction and should be finished during May. Stone for surfacing has been delivered as far as kilometer 10 and will be spread as soon as a road roller can be spared.

Surfacing on the Polangui–Libon Road has been spread and rolled over the entire section with the exception of about 700 lineal meters. This road will be finished in April.

Stone has been delivered on the entire section of the Guinobatan–Jovellar Road from Guinobatan to the steel bridge No. 13.6. The roller is working here and three kilometers have been resurfaced. The Legaspi–Daraga section of the Legaspi-Agus River Road is completed and is now in excellent condition.

Construction on the Jovellar School has been started and it is hoped to complete this project before school opens after the vacation.

The provincial board has appropriated the sum of ₱14,000 for the continuation of the water line from Albay to Legaspi. Water is furnished from the military pumping plant at Regan Barracks, and at present the line extends only as far as the provincial building in Albay. As the water supply in Legaspi is at present dependent on shallow surface wells in time of dry weather, the new line should fill a long needed necessity.

The weather during the past three months has been unusually fine and labor is becoming easier to get, due to the low price of hemp. The province needs at least one more roller very badly. One has been ordered for more than a year, and it is hoped it will arrive in the near future.

AMBOS CAMARINES.—The Pili–Tigaon Road has been completed on March 31st, and with the completion of the reconstruction of the Tigaon–Goa section, the province at present enjoys a continuous first class road system throughout the Partido de Lagonoy. There will be declared next June about 165 kilometers of first class road. There are three regular passenger trucks running through the Pili–Tigaon Road since January of this year and two other trucks, occasionally.

About 600 men are now working on the Naga–Pasacao Road mostly on grading. Surfacing materials are being continuously delivered along the section between Naga and San Fernando and, as soon as sufficient quantity of stone is available, surfacing will be started right away. It is estimated that before June the five kilometers remaining to be graded will be finished. About October all the bridges will have been constructed and a first class road will have been made between Naga and San Fernando. From San Fernando to Pasacao the road will be made second class, just enough to allow light motor trucks to run over until more funds are available to convert the section into a first class road.

Work has been started simultaneously for the Goa, the Labo and the Indan Presidencia. The Goa building is 19.40 m. x 9.70 m. in plan, similar in design to the Parañaque Presidencia; the Labo is a standard 17.0 m. x 8.60 m. building. Additional funds have been appropriated for this structure, so it will have two stories instead of only one as originally planned.

Work for the erection of the several buildings for the Camarines Agricultural School is fairly progressing. These buildings are all to have roof frames ready for iron roofing, but owing to the high cost of materials a super-roof of nipa and bamboo is placed over temporarily.

Four kilometers of Daet–Indan Road has been repaired and the road now is in excellent condition. The cost of resurfacing and shouldering is about ₱2,936 per kilometer. Part of the Daet–Basud Road has been repaired and several culverts placed. This road is first class up to the Calasgasan junction, but the rest is still in a very bad condition. Work will be resumed as soon as new appropriation is available.

Five kilometers of grading of the Talisay–Labo Road has been finished. This is one of the important roads in the province and construction should have been carried more rapidly, but the province cannot afford to give but a small amount of funds for this project year by year.

The services of the District Engineer have been required for the repair of three small irrigation dams of semi-temporary character in the municipalities of Iriga, Bula and Calabanga. Iriga has set aside ₱2,000, Bula about ₱2,300 and Calabanga ₱500. These dams will have to be completed before the planting season.

ANTIQUE.—Most of the materials already purchased for the construction of Dao Central School building are now on the school site. The appropriation has been inverted in the purchase of materials and there is practically a very little amount left to begin with the actual construction. The municipal council therefore had to secure a loan of ₱7,000 to be added to the original appropriation and it is expected that this loan will be obtained. To this end arrangement are being made by the Division Superintendent of Schools of this province to have that amount available. Ultimate preparations are being made for the construction and it is expected to get the work started in the very near future.

The reconstruction of the Sabang Bridge at Bugasong is fully under way. The old abutments and center pier have been reconstructed and the wooden trusses are being placed. This bridge is on the first class road section of the San Jose–North Road and the reconstruction is performed at the expense of the maintenance of first class roads, in the absence of special appropriation assigned for this work.

The construction of temporary wooden trestle bridges over the second class roads of this province has been a feature during the first part of the year and it is to be continued. Two of these bridges have been completed on the San Jose–North Road and two on the San Jose-Dao Road making in all a total of 12 spans at 5.0 meters each. Other temporary bridges and road sections have been improved and repaired lately on this section and also several crossings cleared, which made 50 kilometers of second class road now passable by automobile and other vehicle traffic on the coastal road section of this province. The work involved an expenditure of approximately ₱5,000. The bridges are of second group lumbers locally purchased capable of sustaining not more than 10 tons load. As a means of protection, the bridges are roofed with cogon to insure durability.

In view of the repairs and improvements accomplished on the second class road of the San Jose–North Road, Bitadton, a barrio nearly 92 kilometers north of San Jose, is now accessible by motor traffic and, it is believed, it will be so during the dry season. This is stimulating the people to adopt adequate transportation equipments overland. Formerly, a tourist would experience an entire day of travel on this long and tedious route without meting a carreton on the roads, as the transportation between towns was carried chiefly by common *"cargadores."*

Very little work has been done on Project No. 37, San Jose–North Road owing to the limited amount of money set aside for extensive construction work. The opening of a road diversion on Km. 44 and the surfacing of more than one kilometer of road between Tibiao and Culasi have been undertaken. The available balance of ₱688 is being reserved and will be applied only in emergency cases for the maintenance of certain sections of this road.

From the month of January, 1919, the work on the Antique–Capiz Road has been progressing gradually. Schemes have been devised, however, in order to hasten the work by the application of drag scrapers. One kilometer of this road has been opened and finished with a second and third course surfacing during this time, besides a considerable amount of excavation work along a stretch of 500 meters of hilly section on Kms. 124 and 125. It is practically surfaced up to Km. 126 except in this hilly stretch, and when it is fully widened and cut down to the desired grade the metalling will be placed. From Km. 126 up to the boundary line there remains twenty-one and one-half kilometers of road to be constructed. This is practically opened and partly graded. As it is also hilly there is much work to be done yet especially in widening and in cutting the grade down to the approved plans. However, there are prospects for its completion or at least to open the road to all traffic within a few months, should the field orgnization continue to improve as experienced in the past few months. The practice of using drag scrapers in connection with the excavation work has been adopted. In spite of the present sickness of the common beast of burden employed in such work, a few may yet be seen working on this road. The writer has observed in a great many instances of the facility afforded by the application of drag scrapers manufactured by the laborers themselves on excavation work. This is an effective auxiliary tool used with the plow and it is far more advantageous than imported scrapers owing to its comparatively low cost and to its lightness which is adaptable to the common native beast of burden. This tool used under favorable condition cannot fail to render a work 50% cheaper, and labor and imported tools can be therefore diminished considerably. Inasmuch as the aim is to put this construction to completion within the shortest possible time, and as tools had been already requisitioned, the full force will be put on this road as soon as tools arrive. The field force had to depend only upon the limited amount of tools on hand and consequently a moderate progress has been observed for the last quarter. The work on this road consists of subgrading and metalling. No rolling has been or will presently be done, and, in the absence of a road roller, the road will be left to be packed by traffic. Indications are that the finished road is gradually hardening well with the present traffic and it has been decided to leave the rest to the same fate.

Project No. 55, construction of the Antique–Iloilo Road, is the most important of all road projects undertaken by this province. There were only a few men working on the road at the beginning of the quarter, but with a little effort the force has been increased so that for the last month there was an average of 400 men working daily. The work consists of widening and putting the subgrade to an approved grade, and the metalling. Three and one-half kilometers of this road has been prepared to the desired grade and metalled with 1st course and with top course binder and also nearly one kilometer is prepared from the boundary line toward Antique ready to receive metalling. The force on this project has been divided into two groups working from both ends toward the center. Out of the 12½ kilometers of road to be constructed 5½ kilometers is practically metalled with 1st and top courses. With the one kilometer of subgrade already prepared from the boundary side, one kilometer on Km. 20 and another between Kms. 21 and 22, there remains only aboutt 4 kilometers more of subgrade to be widened and excavated. It is expected that 200 more men will be secured and will be placed on the above mentioned section. Two temporary bridges with roofs have been constructed during the quarter, making a total length of 25 meters. Owing to the big amount of excavation to be undertaken along Kms. 23 and 24, it is hoped that if the present force continues to work with the prospective 200 more, the subgrade will be nearing completion if not completed before the heavy rains come. The construction of wooden bridges will be continued and construction materials are being prepared to supply the needs of the stream crossings which are to be bridged in order to have the entire road open for future traffic.

Metalling on this road is confined to 1st course alone with some sort of top course binder owing to the lack of 2nd course materials in the neighborhood. This method will be continued till the entire road is completed and then arrangements will be made in order to secure 2nd course material to complete the metalling. The 1st course when thoroughly rolled with a convenient binder presents a fairly good protection of the subgrade and it will not in any way hinder future traffic while the 2nd and 3rd courses will be placed.

Tram cars and a 6-ton road roller are in use on this project. It is almost impossible to employ drag scrapers on this project on account of the prevalent sickness of animals at present.

The construction of the Sibalom–San Remigio Road is progressing very nicely. Out of the 10 kilometers of road between Sibalom and San Remigio, during the last quarter 6.37 kilometers of subgrade prepared and 3.5 kilometers metalled with 1st course thoroughly rolled and with a top course binder. Subgrade is already finished up to Km. 19.37. In view of the proposed new town site for the municipality of San Remigio the work will have to end, for the time being, at Nasuli, Km. 19.37, which is close enough to the proposed town site. Therefore there remains to be metalled yet a distance of about 3 kilometers.

Tram cars and a 10-ton road roller are in use on this project. Hauling gravel by basket is also undertaken on this work. Should this progress continue I believe that the surfacing of this road up to Nasuli will be completed before the month of August. Two of the stream crossings will have to be bridged with temporary wooden structures and unless local lumber can be secured the necessary materials will be purchased from Iloilo.

The Domestic Science School Building has been completed in accordance with the approved plan furnished by the Bureau of Education. This is a wooden framed structure on concrete foundation and roofed with galvanized iron. The cost of construction, provincial surcharge being excluded from January 1st up to the time when construction was completed, is about ₱3,100.

Excavation work has been done on the side hill location of the Bugasong-Valderrama Road. Owing to the very limited amount of fund available at present for this project a trail work is to be undertaken. There is nearly a kilometer of side hill location involving a cut averaging from 5 to 20 meters deep, rocky and quite steep, but efforts are being made to put a trail even of sufficient width only to allow pedestrians to go safely over in order to avoid the inconvenience of crossing the wide river. There is yet available for expenditure an amount of ₱2,156.

BATAAN.—The construction of the interprovincial road which will connect Bataan with Zambales has been started from Dinalupihan, and the work is progressing rapidly. Due to the scarcity of laborers in this province, efforts are being made to secure laborers from Pampanga and other neighboring provinces. The "paquiao" system will be employed as soon as the contractors from Pampanga, Laguna and Tayabas come. Seven and one-half kilometers of this road from Dinalupihan to barrio Coló has been surveyed, and the plan approved by the Director.

The Bataan–Pampanga interprovincial road is practically completed. The surfacing is as far as barrio Culis, and it is expected that before August first the entire length of Bataan section will be completed as first class, thus connecting Bataan and Pampanga and, incidentally, Manila, with first class road.

To replace the old temporary bridge over Layac River on the Bataan–Pampanga Road, a Howe Truss 80′–0″ span is proposed, using the old adobe abutments which are in good condition, and the work will start soon.

Another Howe Truss 60′–0″ is proposed over Pandan River on the Balanga–South Road.

Materials have been purchased locally for the Construction of the Lamao Experiment Station at Limay and work will be started as soon as all the materials are received.

As soon as the materials for the construction of pier and fences at Mariveles are delivered by local contractors to the site, the construction will start.

An additional room in Orani Central School Standard Plan No. 7 is under construction and ten per cent of the work is completed.

Preliminary investigation has been started for the proposed Limay–Lamao Road.

BATANGAS.—With the acquisition of a new 10-ton Kelly Springfield road roller, the surfacing on the Bolbok–Candelaria interprovincial road was started in the middle of February. The whole section is now graded and two kilometers of same are now metalled.

A special allotment of ₱20,000 has been made for the construction of the Rosario–Bolbok Road. Surfacing on same has likewise been started.

In the early part of March the work on the Lipa–Balete Road was suspended for lack of funds. Another special allotment of ₱20,000 has just been received and work will be resumed in the early part of April.

Due to the scarcity of laborers, work on the Tanauan–Talisay Road is progressing very slowly.

The construction of the Batangas Provincial Jail road has just been completed. It is 1.2 kilometers long and asphalt binder has been applied on 150 meters flooded section, despite the fact that the appropriation was only ₱5,000.

Surveys on the proposed Balayan–Calatagan Road have been made. This road will be about 22 kilometers long and will pass through hilly sections in the western part of the province. A special allotment of ₱40,000 has already been made for this road.

The concrete work on the Mabini Memorial School Building is now finished. Additional funds of ₱4,000 have been made for the completion of this building.

Works on the Bauan plan No. 20 school building less four rear rooms will be resumed as soon as the materials ordered from the Bureau of Supply are received. Work on this building was suspended last year for lack of funds. An allotment of ₱15,000 is now available for the completion of this building.

The Cuenca plan No. 4 school building is now 70 per cent completed.

BENGUET.—The repairs on Hotel Pines recently completed included an attractive *porte-cochere* and an inclosed alley way connecting the old and the new sections of the hotel. This improvement added to the comfort of the popular hostelry.

During the past quarter, the following improvements were completed on Teachers' Camp: Bua School, store-room, two cottages, "The Henry," and the garage was made into a two story building the upper story of which is a commodious 8-room dormitory called Bachelors' Quarters. The old Kursaal was torn down and materials used in several of the above structures.

The San Nicolas 7-room school building on Trinidad Farm was completed and occupied.

The tunnel sections on the new Baguio Water Systems are well under way. Wood stave pipe for the gravity section was ordered from the United States. The project, which will cost approximately ₱90,000, will be completed about July 1st.

Traffic over the Benguet Road has been interrupted during the past month, due to the repairs being made in many of the wooden bridges. Funds available this year will repair practically all the wood structures.

The appropriation has been made for the improvement of seven kilometers of the Mountain Trail, which, when completed, will accommodate small cars to go over as far as Acop's place. It is the plan of the provincial authorities to extend this work gradually, opening up additional sections each year to automobile traffic.

The Benguet Auto Line transported during the period January 1st to March 31st, 1919, 585 first-class passengers, 1,009 third-class passengers, 17,260 kilos of hand baggage, and 301,325 kilos of express and freight.

Summary of traffic over the Benguet and Naguilian Roads from January 1st to March 31st, 1919.

Name of road.	Pedestrians.	Bull-carts.	Animals led or ridden.	Calesas.	Motor-cycles.	Automobiles passenger.	Automobiles truck.	Wagons.
Benguet Road	2,161	2,226	1,138	....	19	553	481	2
Naguilian Road	6,312	4,717	585	8	53	924	711	6

BOHOL.—The construction work of the Loay–Interior Road is going on very slowly due to the depletion of the first special Insular allotment of ₱25,000. The province has just reverted an amount of ₱5,500 for this road from the different projects, in order to continue the grading up to the town of Carmen and to transfer the Camp and the Rock Crusher to the barrio of Camanayon between the town of Batuan and Carmen. If funds will be available the construction of this road will be continued up to Bohol Agricultural colony. Upon the completion of this road up to this point, the people of the interior towns will have an easy transportation for their products to the coast towns. At present the declared first class roads on this section extend to kilometer 46 and by the end of this present half fiscal year, this classification will be extended up to kilometer 52,, beyond the town of Batuan.

The construction work of the Quinoguitan–Sevilla Road is going on very rapidly and the grading work will soon be completed up to the town of Sevilla. This is also one of the important roads in the interior which the people of Sevilla and the neighboring barrios have been longing for. They show much willingness to work regardless of pay in order to have this road completed without further delay. Surfacing work of this road has already been started and finished up to the barrio of Sipatan from the Junction. This road should have been passable for any kind of vehicle, had the Armco Iron Culverts ordered from Manila been received and installed on certain brooks within this road.

Great progress on the Bacane–Carmen Road construction has been done. There were employed over 200 men daily on this work. This road will connect to the Loay–Interior Road at Carmen.

Guindulman–Cogtong Road reconstruction is going on very rapidly and, upon the completion of this road, it will give an easy transportation to the people for their products to Cogtong, which is supposed to be a commercial point.

The piles and other materials for the construction of Inabanga Bridge have just been received and the construction of same will soon be started. This will be a collapsible bridge and is supposed to be the first bridge of this kind constructed in this province.

Materials have been requisitioned for the three timber trestle bridges, namely, Maka-as, Bacane and Baguiang, and, upon the receipt of same, construction will be started at once. Upon the completion of these bridges, we shall have an easy and safe ride up to the town of Inabanga, a distance of 72 kilometers from the capital, (Tagbilaran).

The plans for the construction of Dauis Bridge have just been received and as soon as additional funds can be made available, to meet the estimated cost, an advertisement will be made and posted for the prospective bidders for the construction of same.

The construction of Valencia Central Barrio School, Plan No. 7, is going on and possibly same may be used the next school year.

The construction of the three additional rooms to the Bohol Provincial High School are nearing completion. Six more rooms are still lacking to complete the whole building as called for in the B. E. Plan No. 20, Special Pasig Type.

The construction of the Tagbilaran-Wharf is going on and about 250 men are employed on this work daily. Upon the completion of this wharf as well as the dredging of the Tagbilaran Ship Channel, Tagbilaran may be considered as one of the Philippine ports of call for any coastwise steamers.

BUKIDNON.—Work on permanent road location across Kulaman canyon has been started early last January and has been progressing ever since. From 300 to 400 men are being employed. The clearing has reached the river, a distance of 5 kilometers on Impasugong side. Lumber for the proposed bridge over this river is being hauled to the bridge site from nearby forest. It is hoped to open this road for traffic before the 4th of July.

Very little work is being done on Malaybalay–Western Misamis Road due to the lack of funds. The annual budget provides only ₱2,000 for this project, but the Provincial Governor has promised to appropriate some more in the near future.

The extension of telephone line from Malaybalay to Dagumbaan, a distance of 60 kilometers is completed.

Practically all the materials for the Division Superintendent's Office and Residence are now in the building site. Work will be started as soon as carpenters arrive.

Almost all the materials for Mailag Agricultural School were received just recently. Transportation of these materials from Maluco to the other side of Kulaman canyon is being done. Work will commence as soon as these materials are placed on the school site.

On the Diclom bridge construction there is now on hand 38.0 cubic meters of sand for concrete work. Lumber is being furnished by local sawyers. Work will be started upon the receipt of the cement requisitioned a month ago.

Road maintenance is running smoothly this quarter of the year. By keeping several drags and two gangs of some 20 men each, all narrow places including sharp curves have been widened. Correction of subgrade on Mañgima section was also completed. Vehicles will have no more difficulties in meeting each other, with the exception of Lunucan section.

BULACAN.—In reference to the dynamiting which was used in connection with the making of borings to permit the driving of piles for the Santa Maria Bridge construction, the desired results were obtained only after several experiments. It was thought at first that the three and a half meters of sand and gravel on top of the hard adobe which underlaid one half of the bed of the river, had in some way or another an interference against the desired effect. It was thought that the particles of gravel and sand, as soon as the dynamite tubes were fired, were filling the cracks and openings made by the shot, making it necessary to sink cofferdams and take away the layer of gravel and sand to facilitate the necessary testing of the boring for the thickness of the hard adobe. Three cofferdams were sunk simultaneously to avoid delaying the work, one for each pile bent of the structure. As the elevation of the adobe is 2.4 meters below low water, pumping was required. A centrifugal pump of 4" discharge was used. There has been no trouble sinking the coffer-dams and taking away the gravels. As soon as a coffer-dam has been cleaned of sand and gravel, it was tested by sinking through the adobe three three-inch pipe spaced one meter apart, the same spacing of the piles in the bent. Then into each hole twenty sticks of dynamite and ten pounds of black powder were placed into the three tubes. For the lower tube ten sticks of dynamite with five pounds of black powder were placed; for the middle tube, six sticks of dynamite and three pounds of black powder and for the top tube four sticks of dynamite and two pounds of black powder. The lowest tube was placed about fifty centimeters above the bottom of the adobe strata, and then the other tubes were placed one meter above the other. As soon as the holes were filled and tamped the pipe were pulled up clear the top tube and then the charges in the three holes were fired simultaneously. Even with this procedure, the piles could not be driven. Thereby another means had to be used. A 12" x 12" x 24' *dungon* had to be made into a drill puting an inch steel plate made into a ring and acting as cutting shoe. This equipment had to be used as churn for boring a big hole through the adobe but as with this outfit a hole of 20 centimeters in depth could not be churned in a day, this had to be abandoned likewise. Working with the same indomitable purpose we sought another means of overcoming this difficulty. We had the adobe chiselled, but, as it is eight feet below water, rapid progress could not be made. As a last resort, while the men were chiselling the adobe in the coffer-dams, 3" pipes were sunk in a bent, not coffer-dammed, and 60 sticks of dynamite and 25 pounds of black powder were charged into each hole. Five holes were fired simultaneously. After that there has been no longer any trouble driving the piles. This was at the end of February; and during March eighteen reinforced concrete piles were driven. It is expected that the seven remaining spans will be finished at the end of May, and the bridge ready for traffic at the middle of June.

Satisfactory maintenance of the roads in the province could not very well be carried out due to shortage of labor and work animals available for road purposes. Laborers preferred to work in the rice fields or in the cane fields where they get from ₱0.75 to ₱0.90 with two meals a day. The shortage of work animals was due to the prevalence of the foot-and-mouth disease, (rinderpest). The few healthy animals were used either for hauling rice from the fields or for the various uses in the cane fields. To obviate this difficulty the province intends to buy trucks, bancas and lighters.

The work on the Pulilan-Calumpit Spillway had to be suspended after its good start in January, due also to the shortage of men and transportation facilities. The Baliuag–Candaba Road Construction is also being held up. It is expected, however, that during the second quarter there will be sufficient number of men and animals to get along with, and the only fear is that the rainy season may come earlier than usual this year. There have been already two heavy rains at the end of March.

Works on the four school buildings proposed last year, Bustos, Pulilan, Bulacan, and Polo are now being started. No actual construction could be done last year for lack of funds. Resumption of the work on the Calumpit School building will be started as soon as enough funds are made available.

The new project this year is the construction of the bridges between Hagonoy and Calumpit. There are twenty culverts ranging in size from 2.0 to 5.0 meters in spans and two bridges 16.0 meters and 24.0 meters in length respectively.

The municipality of Hagonoy has two very important projects: construction of water supply system with an elevated concrete tank, and a reinforced concrete pile bridge that will connect the two sides of the town. The water for the water supply will be pumped from an artesian well.

During the past quarter four artesian wells have been drilled in the province; three, with successful results. The one drilled in the Barrio of Santa Lucia, Calumpit, has a flow of 100 gallons a minute.

CAGAYAN.—On some sections of the first-class road extensive repairs have been made. The road has been considerably damaged on account of the incessant traffic of trucks and automobiles. There were 1142 cubic meters of gravel delivered on different sections of the road for resurfacing.

The second and third class roads in the Itawis District have been partly impassable. Most of the timber bridges have fallen down. The bridges and culverts were repaired and the road was put in good shape. Automobiles are making the trip during these dry months.

The subgrade of the interprovincial, Tuguegarao–South Boundary, road is completed and for metalling same 6,000 cubic meters of gravel were screened and piled on the bank of the river.

With from 600 to 700 laborers the construction of the interprovincial Claveria–Bangui Road is progressing very rapidly.

The construction of the Peñablanca Presidencia is making rapid progress, under the direction of Perfecto Quinan, construction foreman.

On account of the delay of materials from Manila, the construction of the Solana Central School, a Bureau of Education Plan No. 10, was suspended since September of last year. The building will be completed as soon as the windows and doors requisitioned from Manila arrive.

A No. 3 Champion Rock Crusher has been received from the States and will soon be set somewhere between Aparri and Lallo to crush rocks for the construction of Aparri–Lallo Road. A gang has been busy on this road ever since the beginning of the year putting in concrete pipes and culverts.

A complete survey of the town of Aparri was undertaken by this office upon the request of the Municipal Council. Any person can obtain a blueprint of same by applying to the District Engineer, Tuguegarao, Cagayan. The cost of each blueprint copy is ₱3.

CAPIZ.—The plan and profile of the Pilar-Balasan Interprovincial Road survey are now finished and approved. Capiz Province has eight kilometers to construct and is financed with ₱40,000. Iloilo with ₱20,000 Insular allotment has approximately four kilometers of grading and surfacing to do. Work on Capiz as well as Iloilo end has been already started on a "paquiao" scheme.

Survey is being made on the Cabugcabug–Pilar Road which is to connect the Pilar–Balasan Interprovincial Project. The construction of this is very necessary and is given preference to all the others so as to join the insular work with the railroad station at Panitan.

The subgrade on the Mianay–Sigma Road is finished. It is approximately nine kilometers long. A quarry has been opened on the Mianay end for surfacing same.

The work on Ivisan–Loctugan Road is making very rapid progress. Six kilometers of subgrade out of eight has already been completed. With the completion of this work, Ilayan section will be connected with the capital.

The Capiz–Antique Interprovincial Road passing Navas and Pandan has three more kilometers of road to construct up to the boundary. Due to heavy work construction and the isolated location of this project work has been very slow.

The Ibahay–Navas, second-class road construction, is nearing completion. This road will connect Navas, Pandan and the Municipality of Ibahay.

Four kilometers of the Mambusao–Jamindan second class road subgrade has been completed. This is a continuation of the Dao–Mambusao Road to Jamindan, an abaca growing municipality.

The Panay–Pontevedra second class road construction has its subgrade near completion. It is 12 kilometers long.

All the building constructions are progressing nicely. Partial Plan No. 20 for Capiz and Plan No 10 for Pontevedra are all of permanent structures. Panitan School of Plan No. 7 is only a temporary building.

CAVITE.—Work was resumed on the Naic–Indang Road Construction during this quarter, ₱14,000 having been alloted to this project. Grading on two and ½ kilometers remaining is about finished and one kilometer more of surfacing completed.

There was made available ₱7,000 to construct one wing of the Standard Plan No. 7 of the Imus School. The work is now in full swing but it is believed that the ₱7,000 appropriation will not be enough.

There was also an appropriation of ₱7,500 to complete the Alfonso Central School and it is hoped to finish the building within this month.

An appropriation of ₱35,000 was alloted for the Zapote bridge but due to the fact that the total estimate is ₱60,000 no work has been done pending the receipt of more money.

The construction of the Indang and Silang markets have not been started as the additional municipal loans asked for by these municipalities have not yet been approved.

Further investigations have been made on the Mendez Water Supply and the construction will be started as soon as the machinery, pipes and other materials are ordered.

There have been completed 4 concrete fish tables on the San Roque market.

The construction of the Calero bridge, a three 7-m. spans reinforced concrete girder bridge on pile bents, has been started after the receipt of the ₱11,000 insular allotment. The piles of this brige have been driven since 1916 but due to the lack of funds the construction has been suspended till the receipt of this allotment. It is expected to finish the bridge before the rainy season starts in.

The reconstruction of retaining walls for the four irrigation projects, jobs No. 247, 248, 249 & 250, i. e., Labac Ditch, Embarcadero Tunnel, Anod Dam and Pare Tunnel respectively, has all been completed. In spite of the fact that these projects are isolated, that is, all of them are very far from any road and it was at first hard to get laborers to go to these places besides the difficulty of transporting materials, (cement, sand, gravel and adobe stone), the propjects have been finished within the estimates and to the satisfaction of the farmers interested, who already foresee brighter prospects in view of these improvements.

CEBU, COTABATO, and **DAVAO.**—No reports for this quarter were received from these provinces.

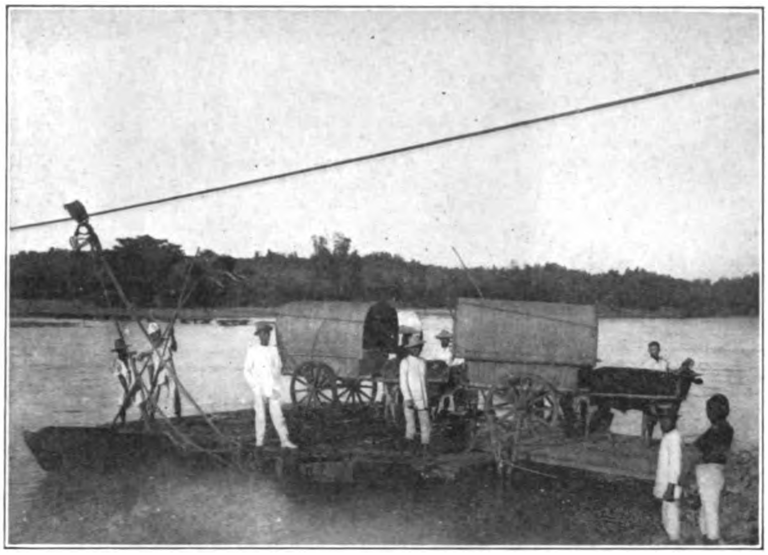
ILOCOS NORTE.—The ravages of the trancazo epidemic were barely disappearing when the frightful havoc of the smallpox made itself felt among the inhabitants, terrifying the whole province and interfering very much with the activities of public works. In spite of all, some works have been executed.

In the first-class roads all the damages caused by past rainfalls have been fixed, the protection to the Laoag Bridge has been finished, several new culverts have been completed and 4 wooden bridges repaired. With the exception of the Laoag–Sarrat and the Suyo–Dingras Road sections which are dusty, due to excessively big traffic, all the first class roads are in good condition.

In the second–class roads some improvements were and are being made also. A diversion 1 kilometer long in the Dingras–Solsona Road, necessary to avoid crossing a creek twice, is 50 per cent completed. In the Dingras–Banna Road all the five wooden bridges are rotten and need complete reparation. The Cabalingasaan bridge 18 meters long is now completed; the Cabaritan and three other bridges are being rushed to completion before the rainy season.

In the Bacarra–Bangui Road the Dirique wooden bridge three 6-meter spans is just completed, the Pasuquin Bridge twelve 6-meter spans is 40 per cent completed, and the Bacarra bridge will be constructed just after the Pasuquin Bridge is finished. The road as a whole is being widened and straightened out as much as available funds permit.

In the Bangui–Claveria Trail workmen are just beginning to increase. There are over 300 workingmen employed at present. It is expected that it will be impossible to finish the trail to Bangui at the expected time due to delay caused by the smallpox epidemic; but there are hopes to finish the greater part of the work if the present conditions improve somewhat.



A view of the balza in the Bacarra Ferry in the process of unloading, Ilocos Norte.

In regards to school buildings there are many under way. Besides the Laoag Normal School, in which project grading work is progressing, there are under construction the Bangui school with ₱4,000 Insular aid, the Pasuquin school with ₱2,300, the San Nicolas school with ₱1,500, the Batac Farm school with ₱25,000, the Paoay school with ₱5,000 and the Piddig school with ₱10,000. With the exception of the Normal School, the Piddig School and the Batac Farm School all were buildings uncompleted due to lack of funds. It is intended to complete them during the summer vacation.

ILOCOS SUR.—Maintenance of first-class roads has been kept up to the standard and at the present writing they are in first class condition, all fords across streams have been put in good condition leaving only two streams to be ferried.

Work has been commenced on the Vigan twenty-room school building and it is expected by June 30th inst. same will be completed. When the building is completed, it will cost approximately ₱60,000. The high cost of material has increased the cost of construction. The work to be done is putting in partition and ceiling.

The work on the Bantay presidencia has been recommenced, but same can not be completed with the amount of money available.

The subgrade work on the Narvacan–Tañgadan Road is near completion. At present heavy cuts are being made on kilometers Nos. 25 and 27. Surfacing is being placed on kilometer No. 32; also two temporary bridges are being constructed. This section of road is part of the interprovincial road between the Provinces of Ilocos Sur and Abra.

ILOILO.—A long continued period of dry weather during the past quarter caused some "ravelling" of first-class road surfacing and considerable dust, but the road system, in general, is in good condition. A ferry having been installed at the only unbridged river crossing between Dingle and Dueñas, the road is now open to automobile traffic from Iloilo to Dueñas and Cabudian. No difficulty has been experienced in maintaining a full force of camineros.

The various Iloilo city streets, maintained under the direction of this office, are in good condition, but require constant attention owing to the heavy traffic. The automobile sprinkler owned and operated by the city aids materially in keeping the streets in good condition.

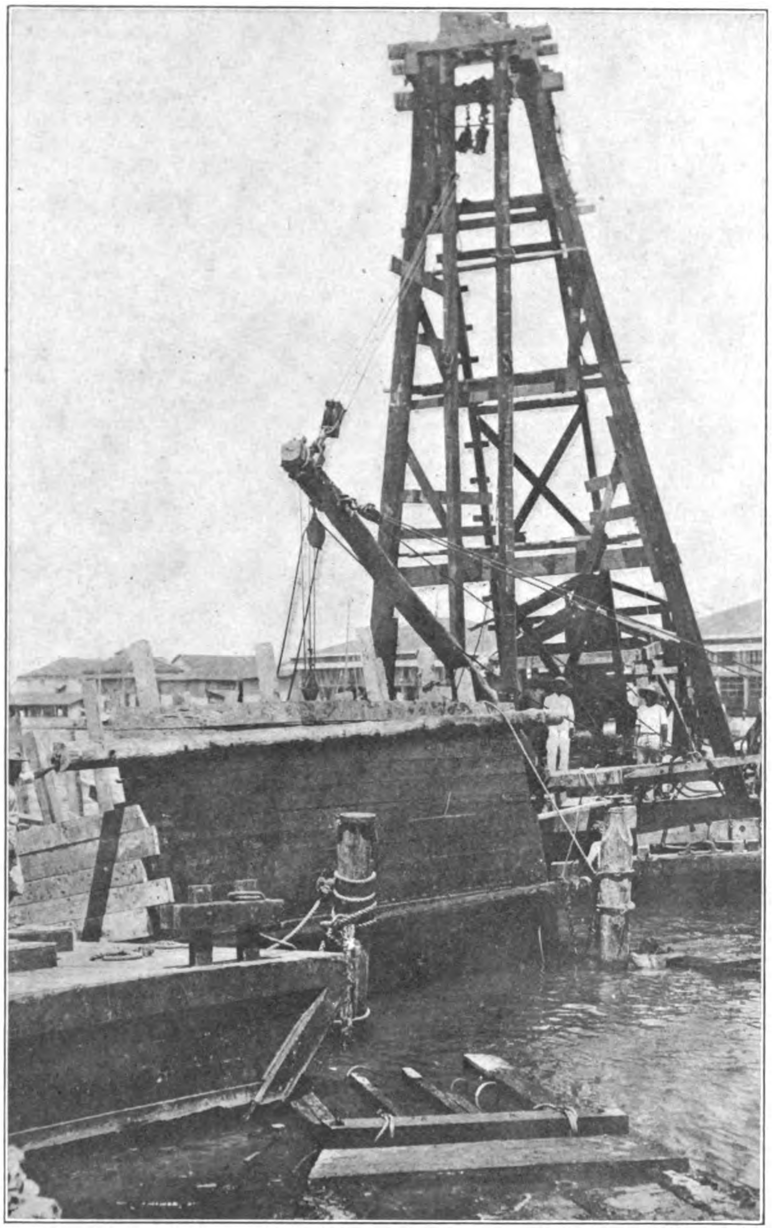
Construction of an overflow bridge at Miagao was begun recently. The standard type concrete spillway is being constructed and is expected to withstand the short but violent floods to which the river is subject. Funds are available for the installation of similar crossings at Naulid and Guimbal rivers.

Several small road projects are under way. Grading on the San Miguel–Leon Road has been completed. A small balance is being expended on the Alimodian–Maasin Road and surfacing is being completed on the Oton–San Miguel Road. Grading by "paquiao" is progressing fairly well on the Janiuay–Lambunao Road and a "paquiao" has just been arranged for the one kilometer section of subgrade which remains uncompleted on the Cabudian–Calinog Road. Small forces are at work grading the Sara–Concepcion and Sara–San Dionisio roads. Only a few kilometers can be graded with the funds available.

Work will be started shortly on the Iloilo–Capiz interprovincial road, between Balasan and Pilar.

A large force of men is at work on the Iloilo–Antique interprovincial road. A trail is being pushed through on the alignment and grade of the finished road. Accurate cross-sectioning after the trail is established will permit a careful study of the difficult points, and close estimates on the work involved. Some very heavy cuts have already been taken out. Considerable bridge and culvert work will have to be done before the trail will be passable. At present, travellers use the old trail.

Work on the Iloilo River Wall has been interrupted by the necessary repairs of equipment. Only a six meter section is lacking to complete the work in front of the Custom House. A 120 meter section will then close the only gap between the two completed portions of the work. Construction can then proceed, at either end, to completion. Business houses are taking advantage of the improved facilities as rapidly as portions of the wall are completed and are constructing modern bodegas on the new street lines.



Iloilo Sea Wall construction. Derrick lifting forms from block 3 to place on block 4. Weight of lift, 15 tons approximately.

Grading on the Zarraga–Barotac Nuevo Road has been nearly completed and the rock-crusher will be set up on Km. No. 27 to crush a lime stone surfacing material discovered at that point. Two 48-inch Armco culverts are being installed on this road and a large number of pipe drains will be required. When completed, this road will offer a short route for through traffic over the Passi Road and the future Banate Road.

Grading on the Barotac–North (via Banate) Road has reached the town of Anilao. The section Barotac Nuevo–Tinorian is being finished up by the application of a thin top dressing of small sized gravel. Only a small balance is available for this work.

ISABELA.—In view of the bad production of tobacco this year, there is no difficulty in getting laborers.

The North Boundary Road sections between kms. 38–41 and 45–50.5 are already subgraded, and now the laborers are busy hauling gravel.

In the South Boundary Road, construction of Angadanan–Cauayan Road, there is only ¾ of a kilometer yet remaining to be completed.

The construction of Angadanan Nuevo to Angadanan Viejo Road, Project No. 56, has again started and it will soon be completed.

The construction of Cabagan Central School, Project No. 37, has already been begun and the foundation is now completed. All the materials are now ready except the trusses. It is expected that the concrete part of the building will be completed during two months.

Construction of Cabagan Agricultural School, Project No. 52, is now completed, and the building has been occupied by the school authorities although the painting is not yet finished.

In the construction of Naguilian Presidencia, Project No. 46, most of the wood-works are already prepared and ready to be placed in.

The site of Echague Farm School at one kilometer from the central part of the town has been staked out; and requisition for the Shop, Domestic Science, and dormitory will be made soon.

There will be a great demand for lumber during this year as there are many wooden school houses, a municipal building and a market which are being proposed. The difficulty of getting building materials, coupled with the lack of means of transportation, will be solved only if the province will operate a saw-mill of its own.

LAGUNA.—The maintenance of the first-class roads in this province has improved materially. The holes and worn-out sections were repaired, the grass on the road shoulders trimmed, and maintenance materials gathered and collected locally, from stream beds. Due to the scarcity of working animals, these materials are being hauled to the depositories in carts pulled by camineros. Considerable enthusiasm and willingness to work were shown by all camineros and capataces in the maintenance gang, which accounts for the excellent up-keep of the first class roads in this province.

The reconstruction of the worn-out first class roads between Kms. 113–119 of Nagcarlan–Magdalena–Santa Cruz Road which has caused considerable annoyance to the traveling public, is progressing very nicely. About 3 kilometers were reconstructed at an average cost of ₱2,889.26 per kilometer. The crushed rock came from Los Baños Quarry and was laid 10 cm. thick and 4 m. wide along the entire length.

About two kilometers of subgrade, averaging 6.5 meters wide, were completed in the Pagsanjan–Luisiana Road construction with a total expenditure of ₱7,686.43, making an average cost per kilometer of ₱3,843.21. During this quarter 12,804 cubic meters have been excavated, 2,560.8 cubic meters of which is rock and the remainder dirt.

From the figures given it is found that rock costs ₱1 a cubic meter and dirt ₱0.50.

Considerable difficulty is encountered in the construction of this important inter-provincial road project. The location is all on side hills and on an upgrade all the way from Pagsanjan to Luisiana. Center, grade, and cross-section stakes have to be given every two days to keep the laborers in the right alignment and grade. All efforts are being made in the field to revise, wherever possible, the location, with a view to compensate the cuts and fills, to keep the lines straight wherever convenient, thus eliminating unnecessary curves, and to reduce the grade to a minimum. The ruling maximum grade allowed, however, is 5 per cent.

The construction of Santa Cruz–Pila Road has made a very good progress during this quarter. Three kilometers were completed and another two subgraded and rolled. In spite of the high cost of transportation of gravel used for surfacing, the average cost per kilometer for the total six kilometers finished amounted to ₱3,421.16 only.

The provincial prisoners and a gang of 15 men under the direct supervision of the District Engineer were kept working in the repairs of the Lumban–Mabitac–Santa Maria Road. Deep mudholes have been covered up and several ingot iron culverts installed.

The 50 Bilibid prisoners were transferred from the construction and repairs of the Mabitac–Siniloan Road to the Alaminos–San Pablo Road. ₱2,000 was donated by the municipality of San Pablo for its construction. About 2 Km. was already subgraded and one kilometer surfaced and rolled and converted into real first class road.

About 50 Batangas laborers were imported from Batangas and these were employed in the repair of the Majayjay–Sambat Road, which has been in a worn-out and almost impassable condition for years past. Considerable progress was made during this quarter and it is hoped to have this road passable by automobiles during the coming rainy season.

The provincial board has set aside ₱5,000 for the surfacing of the Biñan–Carmona Road. The stones were all ordered from the Los Baños Quarry and already distributed along the entire road by carretones. We are only waiting for a road roller in order to finish the road.

The Pagsanjan waterworks is progressing nicely. The excavation of the reinforced concrete tank is already finished. The sand and gravel have passed the test of the Bureau of Science and are being gathered and transported from Pagsanjan River to the tank site. Considerable difficulty is encountered in the transportation due to the elevated location of the tank which is 160 ft. above the town elevation. The cast iron pipes and specials have arrived and were hauled to their respective sites. Excavation of the trenches has been started and it is planned to connect and lay the pipes together as soon as the necessary materials arrive from the Bureau of Supply.

The final plans for the Bay Waterworks have been completed. Materials were already ordered from the Bureau of Supply and construction is expected to begin soon.

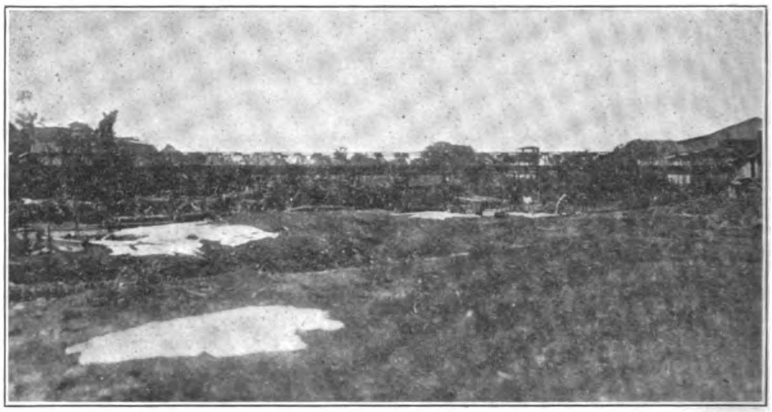
Sixteen thousand pesos municipal funds, secured from bond issued under Act 2773 of the Philippine Legislature, was made available for the proposed municipal waterworks for Majayjay, a municipality located some 11 kilometers from Magdalena and 918 feet above sea level. With insular aid from Manila, which amounts to ₱32,000, there will be available for expenditure ₱48,000 for this project. ₱5,000 worth of cast iron pipes and specials were already ordered from the United States. The plan for the 120,000 gallon reservoir is being prepared in the Manila office.

Final plans are now underway for the proposed waterworks for the municipalities of Santa Cruz, the provincial capital, and Nagcarlan. ₱70,000 is the tentative estimate for Santa Cruz and ₱33,000 for Nagcarlan. The Municipal Council of San Pablo, has set aside ₱9,000 for the construction of a barrio school, Bureau of Education plan No. 3, for the Barrio of San Nicolas, San Pablo. Materials for same were already requisitioned and construction will be started as soon as materials arrive from the Bureau of Supply.

The construction of Santa Cruz Intermediate School was started. The excavation for the foundation is finished and it is expected to pour concrete as soon as reinforcing steel and form lumber arrive.

The temporary timber bridge over the Molawin River, Los Baños, was finished and opened to traffic. The excavation of the two abutment sites is already finished. The plans for the two abutments were revised to meet the sandy clay foundation found at the bottom of the excavation. Various revisions were suggested but the spread footing foundation, spreading it 3 meters back of the proposed footing, was adopted to meet satisfactorily local conditions. Concrete was already poured in the footing for the Los Baños abutment.

Twenty-one I-beams were repaired and set in place in the Sta. Cruz Steel Bridge repairs. The I–beams were being repaired at the shore and rivetted in place during the night time when there is very little traffic over the bridge. The old painting of the steel members were scraped off and repainted with two heavy coats of red lead paint.



Santa Cruz Steel Bridge, Laguna.

The repairs on Magdalena Street are making a very good progress. Almost all the municipal streets were subgraded and surfaced with stone from the Los Baños Quarry, and thoroughly rolled by the Provincial road roller. Various reinforced concrete culverts were installed.

The repairs and reconstruction of San Pablo Street is 70 per cent completed. A road, averaging 6 m. wide and 600 m. long is being built around Lake Sampaloc. The subgrade is already finished, but not yet rolled. The surfacing will be put on as soon as the steam road roller arrives at San Pablo. The modern Garbage Crematory in this town is 90 per cent completed. The cast iron grate bars are being fabricated by the Atlantic Gulf and Pacific Co. and will be delivered through the Bureau of Supply. As soon as these arrive they will be set in place.

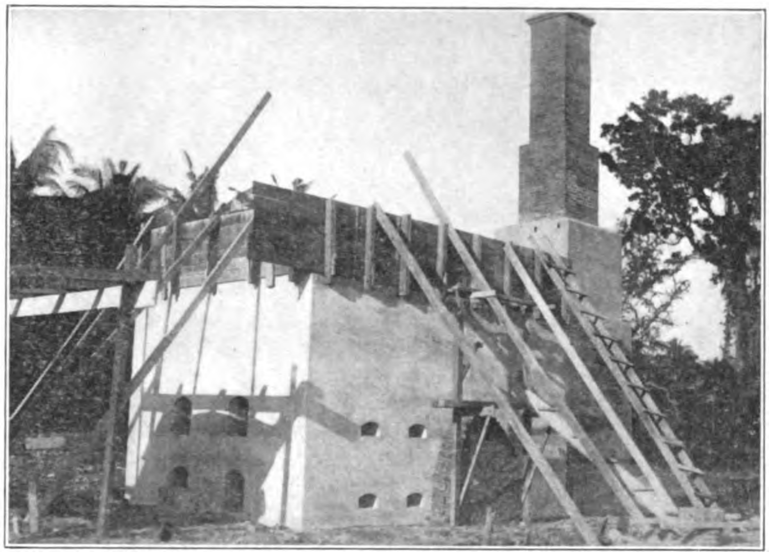
A midden shed with 6 flush closets and 2 urinals with the corresponding septic tank is being built for the market at San Pablo.

Four successful artesian wells were drilled in the municipality of Santa Rosa during this quarter.

The repairs of the Constabulary barracks were completed and accepted by the Constabulary authorities.

The construction of the Athletic Field Grandstand for the Southern Tagalog Inter-Provincial Meet, with a seating capacity of 300, was completed and accepted by the school authorities.

Under Act 2773 of the Philippine Legislature ₱24,000 was appropriated for the construction of a modern market for the municipality of Majayjay. The market is of special design, 17.59 m. by 12.35 m. with flat galvanized iron roofing and concrete floor. The final plans are being prepared in the Manila office.



San Pablo Garbage Crematory, Laguna.

From January 1st to March 31st, the total output of Los Baños Quarry was 9,076.5 cubic meters, amounting to ₱18,153, while our expenditure during the same period was ₱10,683.84, excluding surcharges, or ₱11,645.40 including surcharges, giving a net profit of ₱6,507.60. This output was distributed among several provinces and individuals as follows: Province of Laguna 2,584.50 cubic meters; Province of Batangas 2,320 cubic meters; Province of Cavite 1,240 cubic meters; Province of Rizal 1,100 cubic meters; Province of Bulacan 780 cubic meters; Manila Railroad Company 780 cubic meters; Camp Eldridge 186 cubic meters; College of Agriculture 66 cubic meters; and Mr. William Ahern 20 cubic meters.

During the same period last year the total output was 4,399.5 cubic meters or an increase during this quarter of 4,677 cubic meters. This notable increase of output is due to the coöperation of the Manila Railroad Co. in furnishing the Quarry with 14 N. B. cars of 20 cubic meters capacity each, entirely to our disposal; while last year at the same period there were 6 N. B. cars only assigned to Quarry. The efficient organization and operation observed during this year contributed considerably to this effective increase of output.

LANAO.—Weather conditions have been unsually good for road maintenance and all roads in the province are in the best shape known for years. There is a shortage of maintenance material along the coast as the strong northeast monsoons have covered with sand most of that formerly available.

The Tamparan-Kalawaig has been cleared out and is in excellent shape. This trail requires an annual clearing as during construction all large trees were cut both sides of the trail for a distance of about fifty feet. This place has since been grown up with underbrush and raspberry vines which almost close the trail in places at times.

The Dansalan-Ganassi Trail is likewise cleared out the first time for several years, there being more funds available for maintenance of trails. This trail is passable to automobiles for about thirteen kms. since the bridges have been built to that distance. By the expenditure of about ₱4,000 for relocation and reconstruction of about two kms. of this trail and for building the bridges beyond the Malauig river, this trail can be made into third class road passable to all kinds of traffic during the dry season. By opening this trail to Ganassi to auto traffic it would be possible by adding a few small bridges beyond Ganassi to travel almost to Lake Dapao. This trail is one of the most picturesque of the province.

The construction of Iligan-Misamis Boundary Road was somewhat slow during the last quarter as the Moros have been at work in their fields so that road work lagged due to labor shortage. During the past three months there were three kilometers of road grade built, leaving about three kilometers of unfinished road grade so as to complete the subgrade to the Misamis boundary.

Practically all the pipe culverts are now in place on the Iligan to Mandulog section and the temporary bridges on the other side of Mandulog river are under construction.

There were practically no piles driven on the Overton Wharf since September due to shortage of piles. Construction was however resumed on February 21st, since which date the wharf was extended 140 ft., leaving 90 feet yet to be finished. No decking is on the ground and only a part of the stringers; however, the stringers are being delivered by local contractors, and decking is expected shortly so that, with no unusual conditions, it is probable that the wharf can be opened by about the first of June.

The survey and investigation of the Agus river channel have been made and report on same submitted with the recommendation that the project be pushed this year, if possible, due to the unusually low stage of lake Lanao, making it possible to do the work with greater ease and dispatch and less expense.

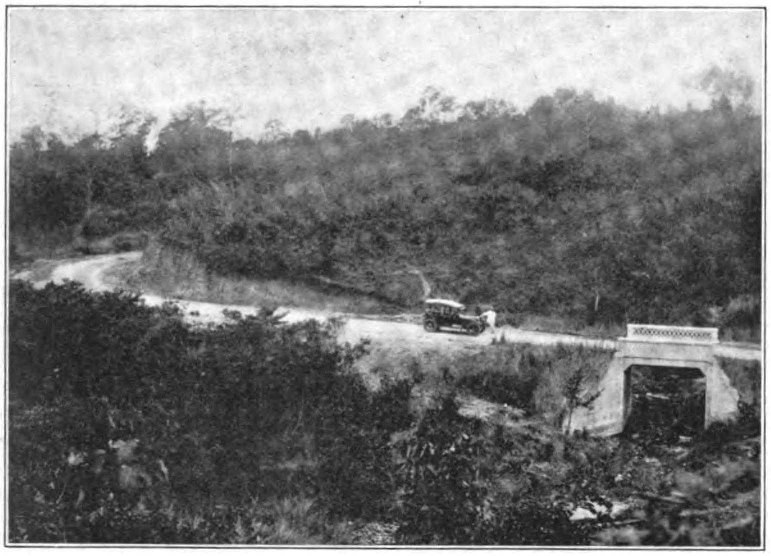
LA UNION.—There has been considerable progress made in the construction of roads in the Province of La Union during the last quarter from January, 1919.

Second course surfacing completed. Government cottage on back ground, Kawayan, Camp One–Aringay Road, La Union.

Deep cuts Km. 252 in adobe stone, Camp One–Aringay Road. First course stones shown. La Union.

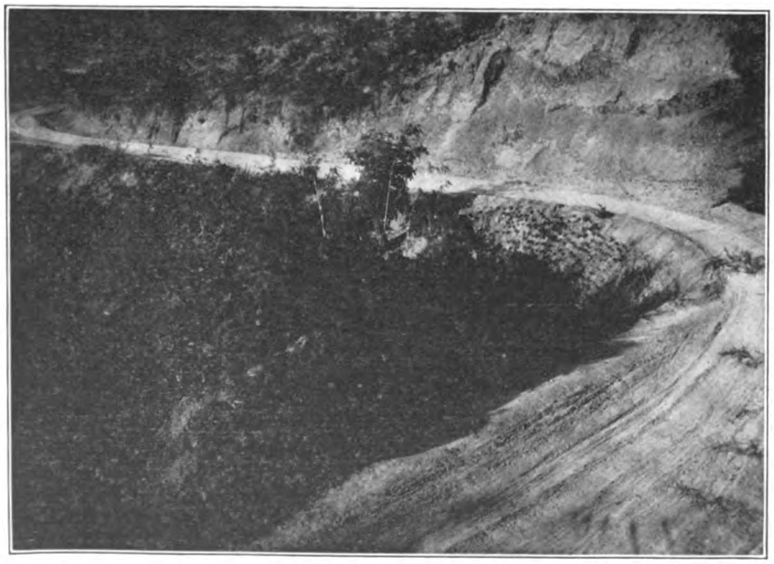
On Camp One–Aringay Road alone there has been surfaced with gravel for the last three months 5.8 kilometers of first course surfacing and 8 kilometers of second course surfacing bound and rolled. The two road rollers of the province are working day and night on this road in order to keep pace with the progress that is being made in gravelling the road. It is the intention of this district to surface the road from Camp One to Damortis before the rainy season begins. Many bullcarts from Naguilian, Bauang, Aringay, Agoo and Rosario are working on this road, and there exists a keen competition among the bullcarts men in the purchase of the gravel already picked and screened by the outsiders. Many men and women including children are actually engaged in picking up gravel and the hauling is done during the night time as well as during the day as many of the haulers do not want their animals to suffer too much from the heat of the day. Between Santo Tomas and Agoo the following reinforced concrete rectangular culverts have been built and completed:

No. 267.35	3.0 meters by 1½ meters double.
No. 267.56	2½ meters by 1.0 meter double.
No. 268.30	1½ meters by 1.0 meter double.
No. 268.88	1.0 meter by 1½ meters.



Zig-zag Km. 253, showing culvert No. 252.59 of 4.50 M. x 4.00 M. Rectangular, Camp One–Aringay Road, La Union.

There were also made and placed along Rosario Road about 250 lineal meters of concrete pipes. Materials for the bridges over Agoo, Cupang, Santo Tomas and Baracbac Rivers have been ordered from the Bureau of Supply and the lumber for the bridges over Rosario creek and Saitan River near Camp One is being cut and sawed from the forest of Rosario. It is expected that these timber bridges will be completed within this year. The bridge over Agoo River is Standard Timber Trestle, four spans of 6 meters each; that over Cupang consists of two 6-meter approaches and a central span of 60 meters combination Howe Truss; that of Santo Tomas River is a Standard Timber Trestle, four spans of 6 meters each; that over Baracbac is a Combination Howe Truss of 50 foot span; those over Rosario Creek and Saitan River are Standard Timber Trestles of two and four spans respectively at 6 meters each. This list completes the bridges between Camp One and Damortis except that over Boed River which will have to be a steel suspension bridge of about 140 meter span, and that over Linañgoyan which will be a Combination Howe Truss of 120 foot span. The bridge over the latter river will probably be constructed out of the lumber from Rosario forest. As it is contemplated to complete the first and second course surfacing of this road from Camp One to Damortis by May the construction of the suspension bridge over the Boed River will have to be taken in the near future if it is the intention of the Bureau of Public Works to utilize this road for the Benguet Automobile Line. The Camp One–Damortis section has a length of 15 kilometers against 36 kilometers of Camp One–Mangaldan route or against 43.7 kilometers of Camp One–Dagupan Road. There is actually a railroad station at Damortis and, besides the advantage that will be gained in saving the distance, the maximum grade in this road is only 5 per cent.



Zig-zag Agoo–Tubao Road, La Union, showing heavy cuts and fills.

The work on surfacing the Agoo–Tubao Second Class Road has progressed equally satisfactory. The hauling of gravel here is done by administration and is not paid by the cubic meter as is being done in Camp One–Aringay Road. The road follows the Agoo River and the source of gravel is near, and effective inspection is easily made upon the men picking gravel and bullcarts hauling the same. There has been covered 7 kilometers of first course surfacing, 10 cm. thick, bound and rolled. There only remains about 300 lineal meters of unsurfaced road. The second course will follow immediately after the first course is completed. The idea in putting all the first course before the second is begun is that once the first course is laid work can progress in putting the top course even during the rainy season. It is contemplated to finish the entire surfacing within the next quarter. The lumber for the superstructure of the proposed Macalba bridge is ready for erection. This bridge is a timber trestle of five spans of 6 meters each. The materials for the six-meter Timber Trestle at Km. 1 have been requisitioned at the beginning of the year.

The first and second-class roads in the province are in good shape. San Fernando–Bauang Road is now being reinforced with gravel surfacing to replace what is already worn out by the heavy automobile and bullcart traffic on this section. Same is being done on San Fernando–Bacnotan Road. The timber bridges between Balaon and Bangar have been repaired. One is of nine 6-meter spans and the other is of four 6-meter spans. Twenty four piles which were already worn out were replaced by new ones and part of the superstructures was repaired.

The surveys of the proposed San Fernando–Poro Road and the wharf sites at Poro Sur have been made and completed. The military authorities at Camp John Hay at Baguio have been projecting to construct a concrete wharf at San Fernando Harbor, La Union. The intention is to bring their supplies here by boat and discontinue carrying same by Manila railroad and thereby effect a saving in the cost of transportation. At first the District Engineer in this district made survey and soundings at the old Spanish Wharf site at San Fernando, at the request of the Military Authorities, but the Director of Public Works on his last visit here recommended that the proposed structure be built near Poro Sur, basing his objection on the old site as being dangerous and expensive. The survey showed here that at a distance of 1,200 feet only 23 feet and 7 inches of depth of water was obtained at low sea level. Two different sites for the proposed wharf were surveyed at Poro Sur. One gives a depth of 40 feet of water at a distance of 400 feet from the shore, and the other, 42.83 feet depth of water at a distance of 425 feet from shore line. The Director of Public Works has chosen the latter to facilitate the movement of ships and to cut the length of the proposed connecting road. Survey of this was made and plans and estimate of the same were submitted to the Bureau on February 26, 1919. The proposed road has a length of 3.06 kilometers and the cost of constructing it was estimated at ₱11,439.90 on the average of ₱3,727.56 per kilometer. The surfacing is to be 4 meters wide and shoulders to be 1½ meters. The most economical material for this purpose is coral which is found abundant in the neighborhood. The proposed line is located in such a way that it misses expensive fill and stream crossings and sand dunes which are encountered in Kms. 2 and 3. This project is of great significance to the town of San Fernando in particular and to the province in general.

LEYTE.—The year 1919 will witness the completion of a number of buildings in Leyte Province. Some of these building projects have been active since the preceding year. Materials have been ordered but construction could not be started at the time because of insufficient funds. Loans have been requested by the municipalities but were not obtainable and in the majority of cases all funds available are entirely municipal.

The Palo presidencia, a standard 9.0 x 15.0 meters two story reinforced concrete building, was staked out March 12, 1919. The total fund available is ₱23,350.45. Gravel is taken from the Malirong a distance of five kilometers at ₱8 per cubic meter placed at the site; sand from the Palo River costs ₱1.50 per cubic meter.

In March 17, 1919, the Alangalang presidencia which is of the same plan as the Palo building was staked out. The work in this building would have been started before the one at Palo but because no carpenter could be found to work on the project the District Engineer had to request the municipal council an authority to advertise for labor only. This was granted and two bids were received the lower being ₱8,725 from Mr. Eugenio Jaro, a local contractor. The District Engineer recommended the rejection of the bid as same was considered too high. A conference was had between the presidente of the town, the contractor and the District Engineer and Mr. Jaro agreed to reduce his bid to ₱8,500. Sand and gravel for this building were taken from the Mainit River; the former cost ₱3 per cubic meter and the latter ₱4.50 per cubic meter.

A standard 21.0 x 32.40 meters type B market is under construction at Burauen with an appropriation of ₱22,059.94. Here, as in Alangalang, the same trouble was encountered. No carpenters could be located in the town and the District Engineer had to import them from some other towns. Sand and gravel are taken from the Daguitan River and cost ₱2.50 and ₱2.80 per cubic meter respectively. Stakes were driven March 17, 1919.

At Dulag a standard 15.0 x 39.0 meters market is under construction with an appropriation of ₱12,551.21. Gravel for this building is taken from the Calbasag and Daguitan Rivers at a cost of ₱3.60 per cubic meter placed at site. Sand is taken from the beach for ₱2.10 per cubic meter.

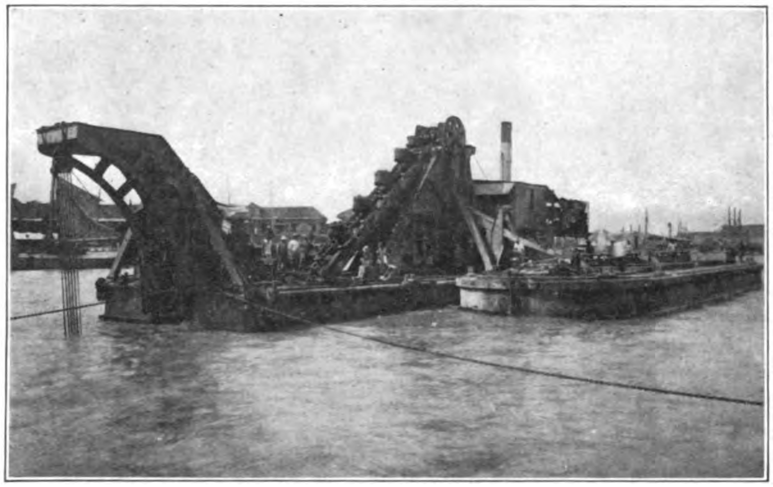
Any surplus fund for the above two markets will be used for the construction of concrete slaughterhouses.

All materials for the Abuyog presidencia have been received but, on account of insufficient funds, construction cannot be started at this time. This is the third standard 9.0 x 15.0 meters two story concrete presidencia building in Leyte.

The work on the capitol is progressing fairly well. All the reinforced concrete foundation and walls are placed to an including three fourths of the second floor.

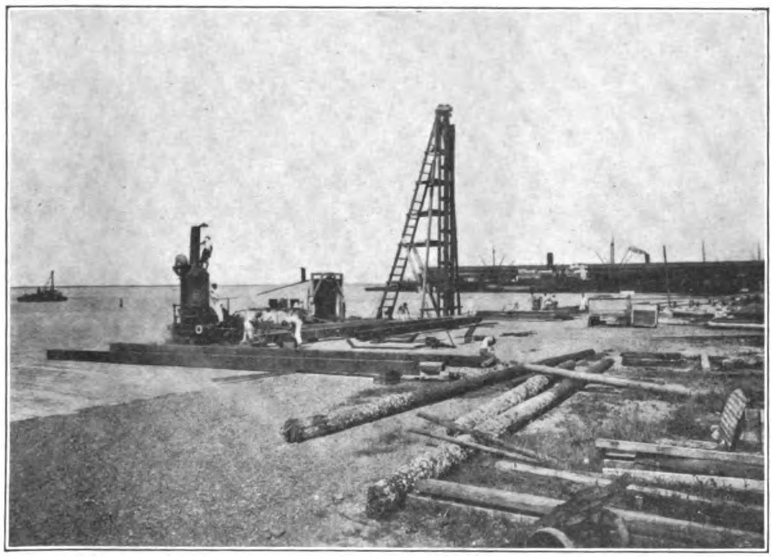
Other building projects under consideration are: Dagami market ₱22,891; Libagon School ₱3,000; Caridad School ₱10,000; and Baybay municipal building reconstruction ₱4,000.

MANILA.—Dredging is being done in certain stretches of the Pasig River which have become silted up in such a manner as to prevent large interisland boats entering at low tide.



25162. Dredge No. 1 at work in the Pasig River.

Preliminary work has been started on Pier No. 7, which is to be one of, if not the largest and best equipped in the Orient. On account of the size and length of concrete piles necessary for this project, special machinery for the handling and driving of same is being built in the United States.

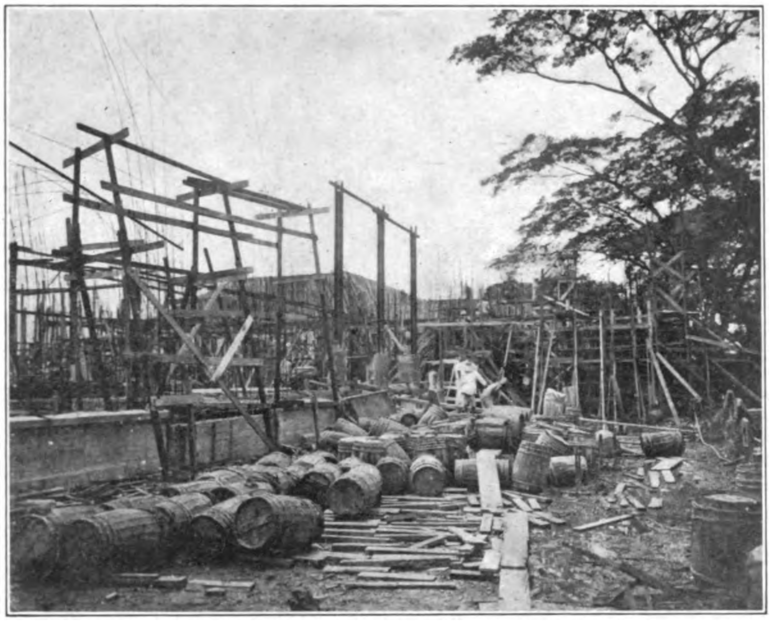


25185. Preliminary construction work, Pier No. 7, Manila.

Arrangements have been made whereby the Bureau of Lands will properly monument the river and harbor lines together with approved estero lines of the cadastral survey of the city of Manila.

Temporary doors were installed at the south end of the pier shed between Piers 3 and 5 to meet the demands of the increased volume of freight, pending the arrival of hardware from the United States. The north end is being rapidly pushed to completion.

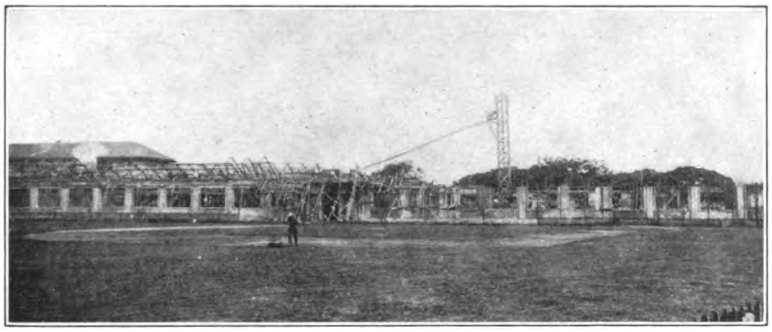
Ground has been broken for the new Executive Building to be erected adjoining Malacañang Palace. This will be one of the most ornate concrete buildings yet erected in the Philippines. The finish will be Romblon marble aggregate.



25153. New Malacañang Executive Building under construction. A few of the steel columns may be seen in the center. Old Malacañang Palace on the background.

The new Insular capitol foundation has been awarded on contract and piles are being driven.

Work on the Nurses' Dormitory foundation, another contract project, has been considerably delayed due to the contractor's difficulty in securing suitable piles.



25080. Academic Building, Philippine Trade School, Manila, P. I., under construction.

The new Academic Building of the School of Arts and Trades is well under way and will fill the school's present need of more adequate space.

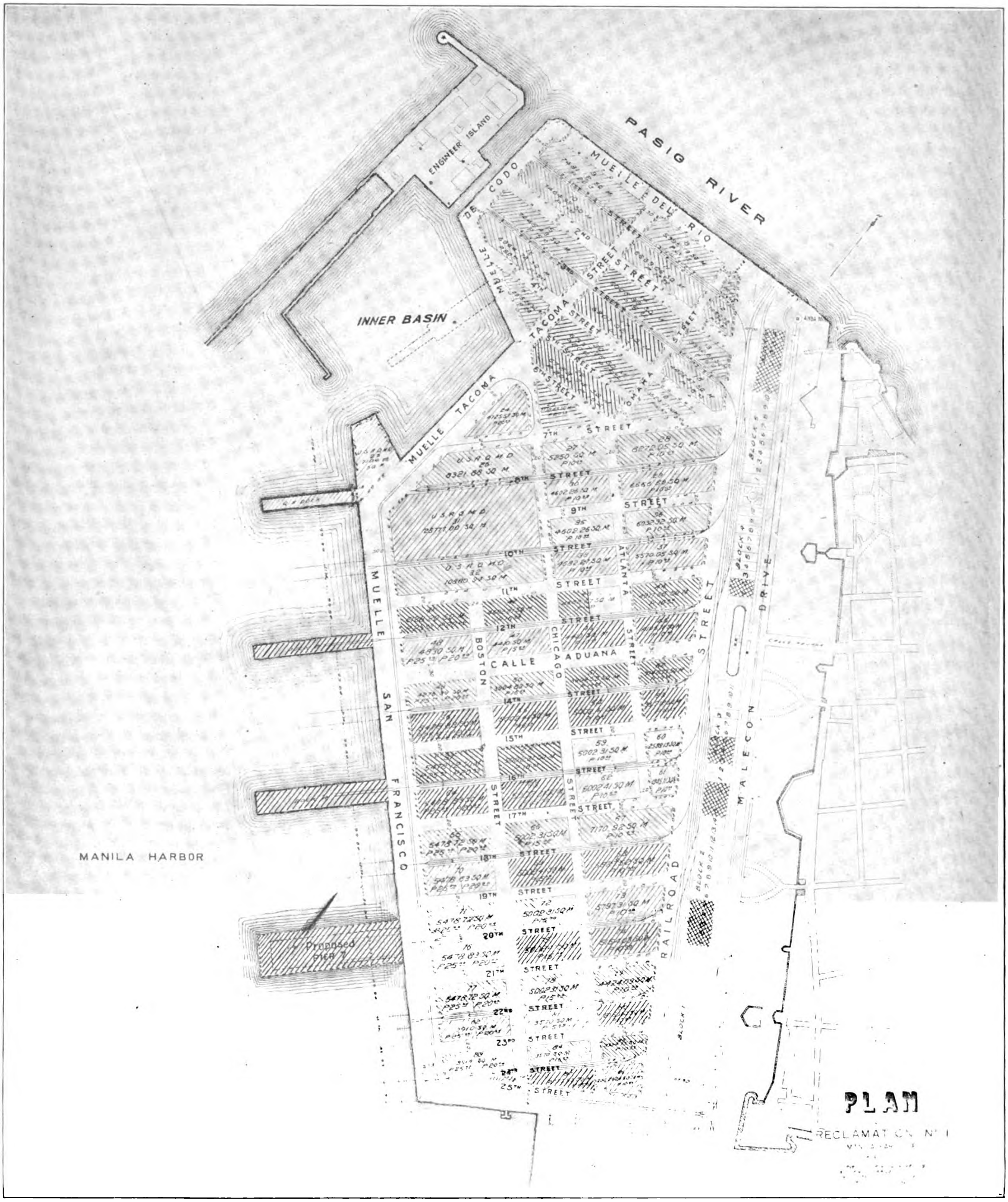
With the large numbers of rush construction projects, considerable difficulty has been experienced in securing semi-skilled and skilled labor.

MINDORO.—The construction of the Calapan–Jolo Road has been going on nicely. The surfacing has been completed to kilometer 9 while the subgrading has reached kilometer 10.

The location surveys, covering a stretch of twenty-three kilometers, and connecting Calapan–Jolo and Naujan–Jolo Roads, have likewise been completed. The construction of the Calapan–Jolo Road has attracted hundreds of people outside of Mindoro to settle and make their homes in the interiors of Calapan and Naujan, and today practically all lands on the sides of the proposed roads are occupied by homesteaders.

In the early part of the year the sum of ₱15,000 was alloted to the Province of Mindoro which sum has already been spent for the construction of roads.

The surfacing work on the Calapan–Baco Road which was suspended for lack of funds has been resumed recently. Hand crushed rocks and corals which are found along the seabeach have been used for surfacing. The work is progressing satisfactorily and it is expected that with the present money available for this project sur-



Plan of Reclamation No. 1, Manila Harbor, P. I., showing location of pier No. 7 under construction.

facing can be completed to the barrio of Balete, a distance of four kilometers from the town of Calapan.

Due partly to the shortage of laborers and partly to the opening of the rice planting season, the construction work on the Pinamalayan–Jolo Road has been progressing rather slowly. Nine kilometers of this road has already been subgraded and the surfacing of same will be begun as soon as more money is obtained for this project.

All the materials for the construction of the Naujan presidencia building have practically been delivered at the Presidencia site and as soon as the additional amount requested for labor is secured the construction work will be begun immediately.

During the quarter an additional appropriation of ₱17,000 has been made available for the construction of a new Provincial Agricultural School of Calapan. The materials for this building have already been requisitioned from the Bureau of Supply.

The Agcauayan Central School, Plan No. 3, Bureau of Education, semi-permanent in type, has likewise been completed during this quarter.

MISAMIS.—The Balingasag waterworks, which at first appeared as a very simple job, turned out to be quite a complex problem. The water which is delivered by gravity is secured from a spring about one kilometer from Balingasag. The difference of elevation between the points of delivery and the spring being very slight, a concrete tank or basin was constructed around the spring proper, excavating down four meters to foundation, which is coral and full of crevices and which allows the water to escape under the walls of the tank before reaching the intake of the pipe line. It is now planned to excavate down on the outside of the tank and fill the crevices with concrete which it is hoped will raise the water to the desired elevation. However, the spring is located at the edge of a swamp or low ground, and the spring may break out in some other place, in which case the entire pipe line will have to be lowered which of course reduces the head and supply of water.

A contract was let out for the completion of the Misamis section of the Tinao–Bukidnon Road, a distance of 8 kilometers. The first course of metalling was dumped with boulders covered with a layer of crushed rock. The work is progressing very satisfactorily.

There being plenty of labor at present, all work is being rushed to the maximum in order to complete as much work as possible before the rainy season when labor will become scarce again.

MOUNTAIN PROVINCE.—Great activity of the work on the reconstruction of Bontoc–Tagudin Road is now being resumed. During the latter part of the first "quincena" of March, nearly 800 Ifugaos arrived in the work, 600 of which number have been assigned to the construction and the rest to the maintenance of second-class road. With 600 men in the construction, it is expected that auto users will be able to reach the divide between Tagudin and Cervantes, about 50 kilometers from the former, before the beginning of the rainy season.

In the maintenance work of second-class road, the 10-ton road roller has put a little less than 10 kilometers of Bontoc–Tagudin Road in fine shape, which can probably compete with any first class road. Due to lack of sawyers, unhewn logs are used in the repairs and construction of bridges in this road.

Bauko presidencia building is now about to be finished, and the Talubin presidencia will soon be started. It will not be long before work on the rest of these presidencia buildings, to be built on standard plan, will be started, and arrangements are now being made to that effect.

Arrangements are also being made to start work in the near future on two suspension bridges of about 50 meter span each, both being in the Bontoc–Tagudin Road.

The Ibulao Bridge which crosses the Mongayan River about 8 kilometers from Kiangan, the capital of the Subprovince of Ifugao, is also about to be finished. This is a suspension bridge of three spans, one of 80′ and two of 40′ each.

Work on the hospitals at Kiangan and Cervantes is still slowly going on, awaiting more money to put these buildings to completion.

NUEVA ECIJA.—A standard 6-room school building in the municipality of Aliaga is 95 per cent completed. The delay has been due to the shortage of laborers and carpenters. However, it is estimated to be completed before June 1st.

Parts of materials for the construction of Cabiao presidencia have been received and construction will be started as soon as the balance is delivered. This is a wooden building which is estimated to cost about ₱12,000.

Notice from the provincial treasurer was received on February 27th, 1919, that ₱20,000 is available for the construction of a Courthouse on top of the present provincial jail. Probably a plan like that of San Fernando, Pampanga, will be adopted.

Maintenance of first-class road has been the most difficult problem in this province on account of lack of money and materials. In the budget for 1919 the District Engineer recommended ₱80,000 for maintenance of 129 kilometers of first class road but only ₱36,000 was approved by the provincial board. Of this sum ₱24,000 were already expended for maintenance and construction of Cabanatuan and Gapan Collapsible bridges. When the present District Engineer was assigned to this province nearly all the gravel depositories were empty and no preparation for the proper care of the road was done due to shortage of funds. During the months of January, February, and March, traffic on the Cabanatuan–Baloc section of the Manila–North Road was so heavy that, unless prompt assistance be rendered and money appropriated, failure of this portion is liable to be experienced any time.

Ten kilometers of grading on Talavera–Licab Road construction has been completed and surfacing has been done up to Km. 141. It is expected to complete grading to Licab if money and labor do not fall short this year.

Shortage of laborers and consequently slow delivery of gravel make the Cabiao–Arayat Road construction slower. Most of the laborers now available are under age and gravel are transported 15 kilometers from the construction site.

NUEVA VIZCAYA.—Owing to the recent epidemic and harvesting in this province, it was almost impossible to obtain laborers to undertake active construction work on the various projects.

Repairs of all temporary bridges on the Villaverde Trail, Bambang–Dupax–Aritao Road and Kasibu–Nantanaan trails as well as Bambang–Salinas cart trail have been undertaken and are progressing satisfactorily.

The construction of the Nantanaan–Gumiad trail is progressing very slowly owing to the difficulty encountered in obtaining the necessary force to carry on the work. This is partially due to the very isolated situation of the place and its being inhabited by practically uncontrolled Ilongotes of the province. While the Christians do not signify their unwillingness to work on this trail, it is believed that very few, if not none, will endure the lonesome life in the wilderness. This is also true with respect to the Igorrots and Ifugaos. However, efforts are being made by this office in conjunction with the help of the Provincial Governor to secure Ilongotes to work there, and it is hoped that in the near future, work will be actively undertaken with a view of reaching Gumiad where it is believed more Ilongotes can be had.

Immediately upon receipt of the notice that money was set aside by the Department of Commerce and Communications for the Bagabag–Isabela boundary road, the necessary force was organized and at the present time work is going on with as many laborers as can be secured. This office will try to secure the maximum force available for this road as the remaining portion for construction epoch is short; otherwise, no result can be obtained.

In regard to school buildings very little has been done. The Murong Barrio School repairs have been completed and the building turned over to the municipal authorities of Bagabag for occupancy. The Dupax School is at a standstill due to lack of funds. However, efforts have been made by the municipal president to haul all lumber materials and hardwares to the school site with gratis labor, and work will be started with the present balance on hand, at the exhaustion of which, if no additional funds are obtained, work will again be suspended. About all the materials needed for the erection of the Bayombong Trade School are now on hand and ready for use. The construction work is delayed, pending the settlement of the site question which is now in the courts for final decision.

Two thousand pesos has been secured for the repairs of the present provincial government building and work will be immediately started as soon as materials are obtained.

Materials to be used in the extension of the telephone system of the Constabulary station at Nantanaan are now on hand and as soon as labor permit work will be immediately commenced.

The maintenance work of all roads in the province has been attended to since the beginning of this quarter and all the roads are in good condition.

OCCIDENTAL NEGROS.—Maintenance of first class roads in this province has been somewhat difficult, and dust has become a nuisance in some places, owing to the prolonged dry weather. Otherwise the condition of first class roads in this province is satisfactory for the kind of materials used in their construction and maintenance.

The construction of Bago–Maao Road was suspended for a long time due to lack of funds, but it will soon be resumed, for the Honorable Provincial Board has recently approved appropriations for this project sufficient to complete it.

Kabancalan–Himamaylan and Kabancalan–Ilog road constructions are progressing slowly due to lack of sufficient and adequate means of transportation for gravel.

The construction of Bacolod–Murcia Road will soon be finished as there is only about 700 lineal meters of this road to be surfaced.

The investigation and survey of the proposed interprovincial road from Isabela to Guijulngan are now finished and plans and profiles for same are being prepared for submittal to the Director of Public Works for approval.

In the construction of Manapla–Cadiz–Fabrica Road, on the section between Manapla and Cadiz, there is still two kilometers to be surfaced. It is expected that this section will be finished by the middle of May next. On the section between Cadiz and Fabrica about five kilometers of subgrade is now finished and the work is progressing satisfactorily.

ORIENTAL NEGROS.—Since the beginning of the year 7.5 kilometers of first class road, south of Dumaguete, have been completed. Road construction in this section is entirely satisfactory due to abundance of laborers and the facility to obtain surfacing materials.

The road roller has been busy day and night in order to roll what has been spread during the day.

The construction of the Siaton School Building plan No. 7 is going on rather slowly, great difficulty in transporting materials and the lack of skilled laborers being the cause.

Work on the Dumaguete–North Road is progressing in a satisfactory manner. Materials are being delivered in large quantities. It is expected to complete the road into Manjuyud by the end of this month.

The subgrade work of the Libertad–Guihulngan section, an 11 kilometer stretch, is being pushed through and it is expected to complete it by June. Metalling will be started just as soon as a road roller can be released from the other projects.

Materials for the Bais School Building plan No. 10 have been requisitioned and construction will be started immediately upon arrival.

The construction of the Bais–Bagtic trail has been suspended in the meantime, awaiting for more funds.

PAMPANGA.—About three kilometers of Lubao–Hermosa Road has already been asphalted. This section was flooded by water last year and all the surfacing materials were carried away. Three of the 14 proposed wooden bridges were already constructed. On account of the difficulty of getting bullcarts to transport the surfacing materials for less than ₱5.00 per cubic meter in a haul of seven kilometers, three wagons each holding nearly seven cubic meters of rock are being constructed, and same will be pulled either by truck or by road roller.

Eight of the 12 proposed wooden bridges for the Mexico–Concepcion Road have already been constructed. Two of these were done by contract and six by administration. As soon as additional fund is made available, the road will be given another course of stone screening from Arayat.

Work on the San Matias–Minalin Road will be suspended next month on account of shortage of funds. Three kilometers are yet to be constructed.

The construction of Candaba Bridge has never been made active. It is proposed by the District Engineer to recommend to the provincial board that the ₱19,000 now available for this project be reverted to some other construction projects which have been suspended on account of lack of funds.

Work on the construction of San Antonio–Floridablanca Road has already been suspended due to lack of funds. It is expected that work will be resumed next semester.

Great effort is being made to complete all the six buildings for the Magalan Farm School before the school opens in June. The frame works of the two teachers' cottages and the mess hall are nearly finished. As to plan No. 7, shop and the Dormitory buildings the foundations and the posts are all up. The framing work for these buildings has been delayed due to the materials for girders and plates which have not yet arrived. These materials were requisitioned on October of last year.

All the work in grading the Magalan Farm School Road was let out by contract. It is expected to finish the grading work before May. As there are not enough funds available, it is proposed to surface the road with two meters wide of metalling.

Plan, profile and estimate for the construction of Angeles–Magalan Road are being prepared and will be submitted for approval as soon as possible. There are two proposed lines: the one starting from the Manila–Tarlac Road between Angeles and Mabalacat, and then joining with the old road to Magalan at about 3.5 kilometers from Angeles; the other route, starting from Angeles following the old road a short way and then leaves it and follows a tangent of about 4½ kilometers where it joins the old road to Magalan.

There are at present four active school construction projects: Angeles Central School, Bureau of Education Standard Plan No. 20, 85 per cent completed; Masantol Central School, Bureau of Education Standard Plan No. 6, 90 per cent completed; Porac Central School, temporary Plan No. 6, suspended due to lack of funds, and San Luis School addition, 96 per cent completed.

Additional appropriation has been secured to continue the construction of Mabalacat presidencia. The requisition for materials for roof framing and roofing is being prepared. The building is 35 per cent completed.

There are at present six towns which have streets under construction in charge of the District Engineer, namely, Lubao, Mexico, Macabebe, San Luis, Santa Ana and San Fernando. Every town in this province is taking deep interest in improving its municipal roads and streets. The provincial board is planning to borrow ₱200,000 from the Insular Government for the purpose of aiding municipalities to carry out their road construction projects.

PANGASINAN.—The subgrades for the Alaminos–Bani a 15 Km. section, Santa Barbara–Mangaldan, 7.80 Kms., Alaminos–Lucap, 4.67 Kms. and the Binmaley–San Carlos Roads, 13.63 Kms. were completed, and are now being surfaced, while the subgrades for the Malasiqui–Sta. Barbara, 8.90 Kms., San Fabian–San Jacinto, 7.5 Kms., Mangatarem–Urbiztondo, 5.3 Kms. and the Mangatarem–Tarlac Boundary roads, 11.65 Kms. are also practically completed. Surfacing has now started on the Malasiqui–Sta. Barbara and the Mangatarem–Urbiztondo Roads.

The surfacing materials for the Alaminos–Lucap Road, 4.67 Kms., was contracted by Don Victoriano Braganza of Alaminos and it is expected to be opened to traffic by July 1st. This road is a route to a sea port.

The Gabon 5 meter culvert on the Calasiao–Urdaneta Road is now under construction, but due to the slow delivery of materials from Manila the work has been suspended. It is about 30 per cent completed.

The Marosay Bridge on the Dagupan–Bayambang Road and the Catablan Bridge on the Sta. Barbara–Urdaneta road will soon be under construction. Both bridges will be of R. C. Deck Girder on R. C. Piles.

The construction of the Urdaneta Market, type A, Standard, 24.0 x 39.10 M is now under construction by the local contractor, Mr. E. Nazareno. The work is 10 per cent completed and is to be terminated June 10, 1919.

The Pozorrubio market 21 x 39.80 M. is done by administration. All footings are now completed. Materials for this edifice are coming along.

Two Rosales tiendas of 10 blocks each have been advertised and are soon to be constructed.

Materials for the Labrador and Salasa schools are partly on hand and work will soon begin.

The reconstruction of the San Fabian Presidencia to be used for intermediate school is almost completed.

Ninety per cent of the San Quintin Domestic Science school is completed.

The construction of San Jacinto Presidencia has already begun.

Thirty per cent of Urbiztondo Presidencia is completed.

Malasiqui Presidencia of Pasig type made of concrete is almost completed, lacking only windows, doors and grills.

The concrete spillways on the Alcala–Bautista Road, having 300 meters in length, were completed last February. These spillways will make this road open for traffic during the entire rainy season.

Reinforced concrete school houses of the Standard plan No. 7 are now under construction by administration in the towns of Sta. Maria and San Manuel. 80 per cent of the former and 60 per cent of the latter are now completed.

RIZAL.—The Manila–Novaliches–San Jose Road has been the principal scene of activity in road construction during the past quarter. Four kilometers have been completed and opened to traffic, thus connecting Novaliches, Km. 18, to Manila. Two kilometers of rough grading have been also completed beyond Novaliches towards Bulacan boundary. Gravel quarried from the bed of the Novaliches River has been used for metalling.

Approximately 3 kilometers of rough grading have been completed on the Morong–Pililla Road, an extension of the Manila–East Road. Big boulders were quarried alongside the road and broken by hand for surfacing materials, costing from ₱1.60 to ₱1.80 per cubic meter.

Plan, profile, and data for the proposed Mango Bridge, Km 34, Manila–Montalban Road, have been submitted to the central office. This structure will be of reinforced concrete slab and girders on pile bents, and will replace the only wooden structure on this road. The sum of ₱30,000 is available for this project.

The construction of the Parañaque Bridge was advertised last month. Bids will be opened on the 11th instant. This bridge, when completed, will supersede the only wooden bridge on the Manila–South Road within Rizal Province.

ROMBLON.—The total 1919 road and bridge appropriation including the unexpended balance of last year and the Insular Allotments for this year amounted to ₱66,658.85 of which ₱16,517.62 was set aside for maintenance of second and third class roads and trails, and the balance for new construction. The first construction of first class road in this province was undertaken this year.

Preliminary survey on the Romblon–Sablayan Road has been started; and following the survey, construction began immediately, completing 460 meters of subgrade from Romblon toward Sablayan.

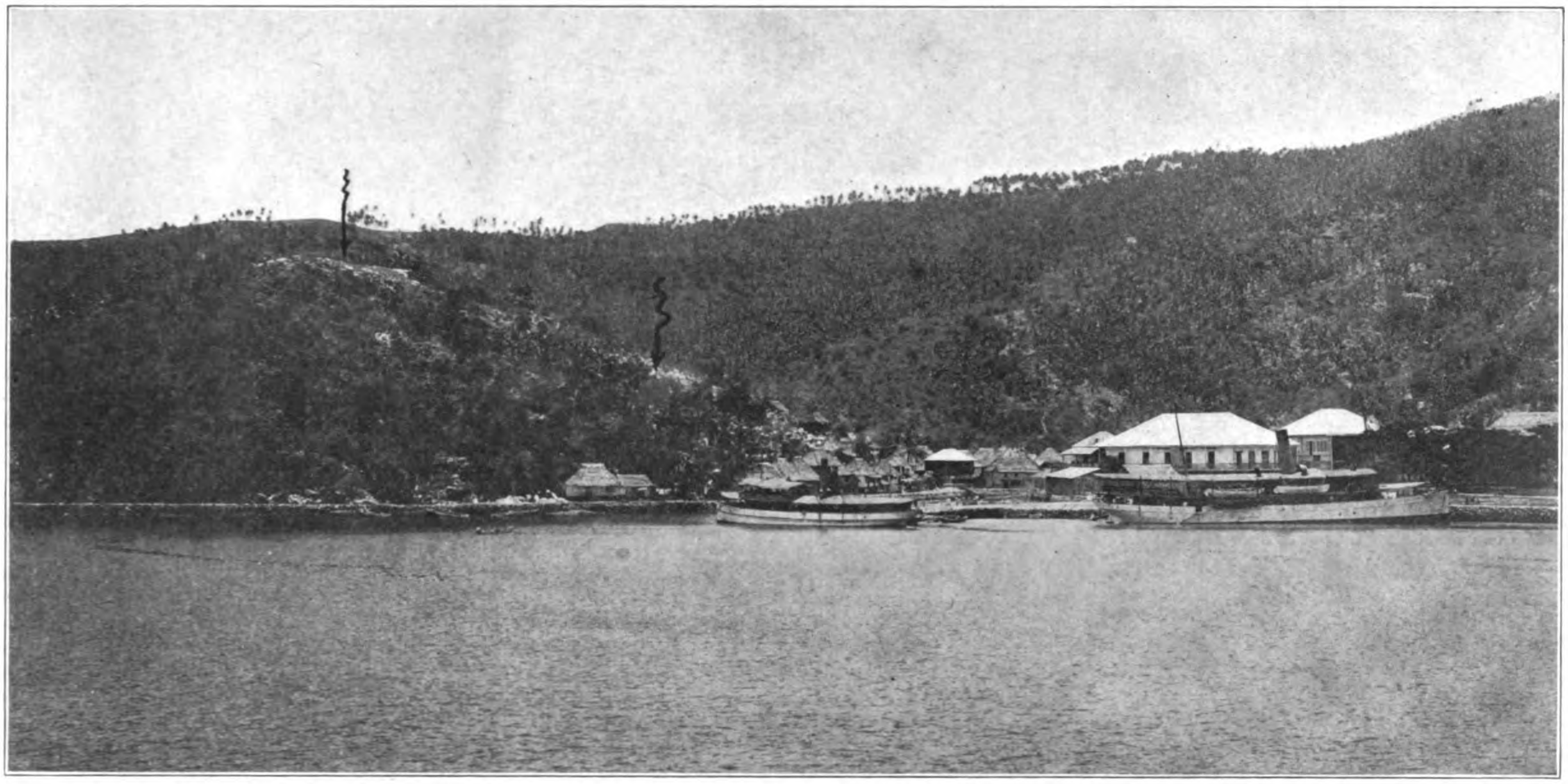
Survey and construction of the Carmen–Odiongan–Alcantara Road have also been started, having 15 kilometers surveyed and 720 meters of subgrade completed from Odiongan toward Carmen.

On Cajidiocan–San Fernando–Magallanes second class road, 11 temporary culverts have been constructed and 8 kilometers of subgrade from San Fernando toward Cajidiocan completed.

SAMAR.—The walls of the Guiuan concrete school, Plan No. 10, are now practically completed. An order for ninety barrels of cement for this project was placed by telegraph with the Bureau of Supply on March 29th and was received and discharged in Guiuan on April 3rd or a period of only five days. This is considered the most remarkable shipment in point of elapsed time made by the Bureau of Supply to the Province of Samar during the past year.

The municipalities of Wright and Guiuan are considering the installation of electric light plants. Funds are being collected in both municipalities for this purpose.

Firewood costing ₱1,946.39 was collected in Calbayog for the use of Dredger No. 3 in deepening the Calbayog River channel. The dredge recently finished work in Tacloban, Leyte, and is now operating



1973. Panoramic view of Romblon Harbor, Romblon, showing Marble Hill on the left center (see arrows), where the famous Romblon marble is quarried. There are other marble hills in this island, but the one shown in the picture is the nearest from the town, being 100 meters distant from the business section. The Romblon marble aggregate was used in the construction of walls of the recently completed Insane Ward, San Lazaro Hospital and of Malacañang Executive Building, under construction, Manila, P. I.

in Cebu. The firewood is in charge of a watchman. Work will be begun when the dredge arrives from Cebu.

A contract for five kilometers of subgrade has been let out for the construction of the Catbalogan–North Road. Work is progressing rapidly due to exceptionably favorable weather conditions. The road location traverses very rough country of shale formation which contains no rock. The surfacing and maintenance of this road will be a difficult proposition.

There are no other projects of importance in Samar under way due to lack of appropriations.

SORSOGON.—The Sorsogon–South Road is now opened to traffic from Sorsogon to Casiguran and Juban. One Monarch 10-ton road roller was ordered for the surfacing of this road from Km. 25 to Km. 44 at Juban.

Several of the temporary bridges on the Gubat–Bulusan Road were damaged by the typhoon of December 1918, but two of them have been already reconstructed. Some of the wooden planks on the steel bridges near Barcelona have been replaced with new ones. Paints have been requisitioned to preserve these steel bridges.

Kilometer 22 of the Sorsogon–South Road is being surfaced with gravel.

Four tiendas are being constructed on the market site of Gubat. These tiendas will be ready for use during the month of April. An additional fund of ₱5,000 was appropriated for the construction of a standard Matadero in the Municipality.

The back wall of the provincial jail and court–house is being constructed and it will soon be finished.

Stones are being piled along Kms. 9, 10 and 11 of the Sorsogon–Gubat Road to be used for surfacing those sections which were greatly damaged by the heavy typhoon of last December. The appropriation of ₱33,000 assigned this year for the maintenance of 99 kilometers of first class roads of the province is not sufficient to keep these roads in first class condition throughout the year. Endeavor is however exerted to have the regular allotment reverted for this maintenance.

The surfacing of the Sorsogon–Albay Interprovincial Road was started by administration from Km. 10 this year and at present it is pressed and rolled up to Km. 13. Grading by "paquiao" system was begun from Km. 14.30 and the work is progressing satisfactorily.

Part of the roofing and the guttering of the Sorsogon High School were damaged during the last typhoon. Galvanized iron materials were requisitioned for their repairs. Several wooden posts on the ground floor will also be replaced with concrete posts and one of the ground floor rooms damaged by the "anay" is expected to be fixed with the present appropriation.

The culverts and bridges on the Lumbang–Milagros Road are in process of construction. The Lumbang–Milagros Road is in good condition and only these bridges and culverts are needed to be constructed.

Several sections of the San Jacinto–San Fernando Road in Ticao Island, have been surfaced with gravel.

The construction of the Masbate Trade School is near completion, the doors are being made locally and the windows and paints were requisitioned from Manila.

Opening construction of the Masbate–Mobo Road is now under way and the bridges and culverts put in. Surfacing of about 4 kilometers of this road will be started soon.

The Guinobatan Bridge is now in process of construction, the false work for this bridge is already erected and the necessary lumber contracted by a chinese "concesionario." As soon as this lumber is delivered at the bridge site, its construction will be intensively done to prepare it for the coming rainy season.

Work on the Masbate–Lumbang–Macatul Road has been started.

SULU.—Grass was cut in good shape along 27.9 kilometers of first class roads and considerable patching was placed and rolled in at a total cost of ₱6,075.70.

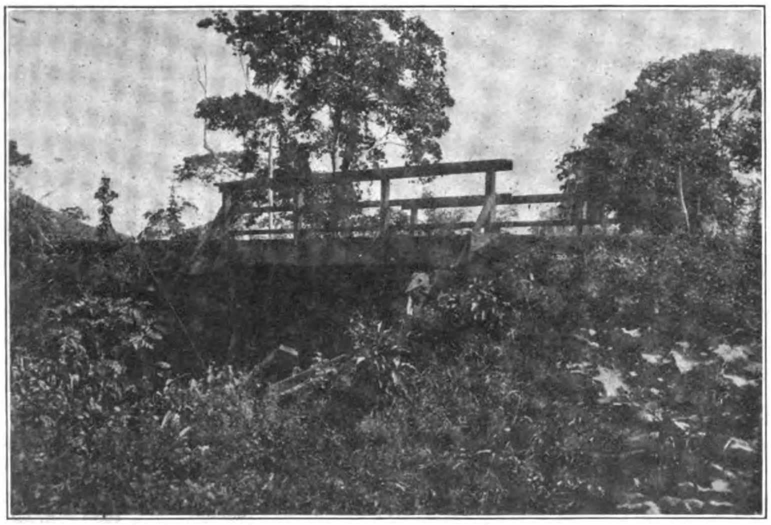
Close view of deep cut in Km. 19, Siet Lake Road, showing tramcars in operation, Sulu, P. I.

View showing heavy fill in Km. 21. Material from a cut in the same kilometer is being transported by wheelbarrows and utilized in this section. It is necessary to put large culverts here as this is a large basin and there is a large amount of water collected from the surrounding hills. Siet Lake Road, Sulu, P. I.

Maintenance of second class roads was done at a cost of ₱67.60 per kilometer. All grass was cut on 16.8 kilometers and patching done along the entire length.

Grass and brush were cut along 10 kilometers of third class roads in the construction of Sulu trails at a cost of ₱58.94 per kilometer.

In the construction of Junction–Romandier–Siet Lake Roads, we have 2 kilometers of grade finished and one rolled ready for rock at a cost of ₱9,465.22 per kilometer, due to heavy cuts and fills. We have also transported sufficient rock and have spread and rolled over two kilometers of road, at a cost of ₱6,169.05 per kilometer. This rock was placed partly on new and partly on old grade. In addition to this we built one new 6 meter timber bridge at kilometer 14 at a cost of ₱1,000. Also 4 Armco culverts were placed at a total cost of ₱750.

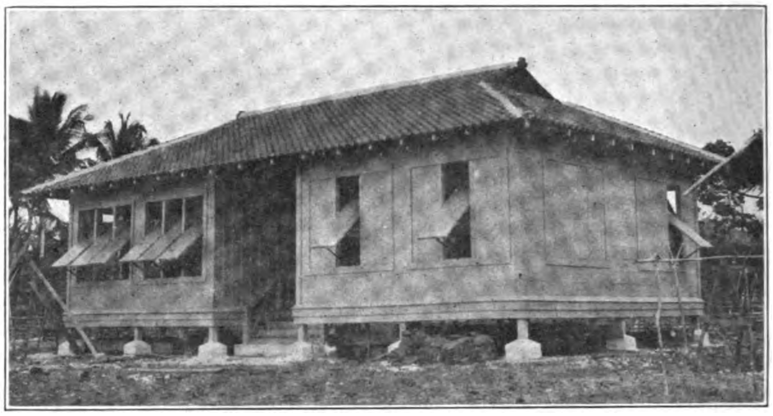


Timber bridge built on Km. 14 Siet Lake Road, Sulu, P. I. This bridge has teak piling, Yacal stringers, Camfor wood decking and hand railing and is figured to carry 15 tons live load. It cost ₱1,000.

A contract for labor for constructing complete the Lugus two-room school building has been awarded to Vicente Alvarez. The amount of the contract is ₱887.40. It was completed in 35 days from the time the materials were landed on the building site. This building consists of timber structure with clay tile roof, costing ₱5,182.81.

Work has been started on the improvements of sanitary drinking fountain at Indanan market, which will approximately cost ₱600.

In the construction of Lapak Agricultural Dormitory building, about half of the materials have been delivered at the building site, including quarried rock and sand. Balance of the material will be delivered by 30th of April, 1919. Contracts for furnishing labor have been awarded to M. Nacagawara for ₱6,000, and for furnishing 65,080 board feet of assorted sizes and classes of lumber, 10,076 lineal feet of form lumber and various classes of hardware to Torrejon, Jurika & Co., for ₱12,545.46.



Island of Lugus, Province of Sulu. Lugus 2-room School Semi-Permanent Timber Building with clay tile roofing. Appropriation ₱5,484.33, Expenses and liabilities ₱5,182.81, Balance ₱301.52. This was finished in 35 days from time material was landed on ground.

Work on waterproofing the open court and repairing and painting the ceilling of Jolo Custom House was finished at a cost of ₱456.39.

We have driven thirteen (13) 50′ teak piles and replaced 10 caps and 1,000 square feet of decking in the construction of Jolo Wharf. Work was suspended for lack of funds. ₱1,827.70 was expended on this project from January to March 31st, 1919.

We have now replaced 621 new telephone poles from Jolo to Camp Andres, a distance of 27 kilometers. These poles were taken from Sibutu at ₱5.25 each excluding transportation.

SURIGAO.—The work for the Bilangbilang–Dock Road improvement has been completed last March. The damages in the first class roads during the rainy season on Kms. 2, 5, 6, and 7, of the Surigao–Badas Road are all being resurfaced. The grading on Km. 17 which is traversing a hill was recently resumed and now tram-rails are installed on both ends of this section for the purpose of completing hauling and placing gravels taken from the Surigao River. From Km. 18 to Km. 20, materials are now placed and ready for rolling by the two road rollers. This will complete the work to reach the big barrio of the municipality of Sison. An advance grading gang is in constant work at Km. 21 to Km. 25 where it is expected soon to transfer tram-rails for hauling and placing gravel. On the Placer–Mainit Road, there are gangs gathering materials for surfacing at Kms. 8 and 9, and a party of surveyors is surveying and investigating the unexplored Tubod–Mainit Road of about five kilometers of this section beginning from Km. 19. This force as soon as available will be transferred on the Placer–Gigaquit proposed road as the province appropriated this year the amount of ₱2,000 for this project.

Surfacing at Km. 17 along Surigao River, Surigao-Badas Road.

The bridges and culverts will soon be constructed on the Surigao–Sison Road. Two of the three semi-permanent bridges, standard trestles: the Toog, two 6-m spans, Km. 17.2, and the Tangbo, one 6-m span, Km. 18.3, are finished. All the necessary materials and the carpenters are being transferred to the Tabangan Bridge site where a standard trestle bridge, one 6-m. span, will be constructed. Culverts are being installed on brooks found between Sison and Badas.

School building construction will soon be resumed. Carpenters have been already contracted for. Part of the materials have been received and sent to the school sites, and the balance is expected soon from Manila. There are three school buildings under construction: Cabuntog in the municipality of Dapa, San Juan in the municipality of Hinatuan, and Tandag Central School. They are located along the Pacific coast, where transportation is very rare, and difficult. It is intended to hire a motor-boat to be assigned to the personnel for the respective projects.

Filling on the High School Ground Improvement has been completed at a total of about ₱600.

Materials for the construction of Lianga Water Supply have already been requisitioned and, upon receipt, they will be sent to the site along with sufficient personnel to take charge of the construction.

The repair of Surigao Wharf fender piles is also completed. The repairs consisted of changing the wooden deck and supplying the damaged upper part of posts with mancono timber. The expenditure for the repair is about ₱880.

TARLAC.—During the first two months of the 1st quarter, very little progress was made on the Tarlac–South Road due, first, to the scarcity of laborers and, second, to noncompletion of Santiago bridge. On the last month of the quarter, however, some laborers from the north of the province have been recruited, and they were put to work on both approaches of Santiago Bridge. The construction of Santiago Bridge was finished during the month of February, and the approaches were finished towards the end of March, but owing to the delay of shipment of the G. I. crosses and tees for both ends of the railings, the bridge could not be opened to traffic. Two of the eight wooden bridges to be built between Santiago Bridge and Pampanga boundary have been finished. These were of 6-meter span, designed to carry a moving load of 10 tons.

The construction of Tarlac–Murcia Road has been temporarily stopped, as the road roller assigned to this portion has been transferred to the Gerona–Paniqui Road construction last February.

Work on the subgrade of Gerona–Paniqui Road has been started during the middle of February, and by the end of the first quarter one kilometer of the road was surfaced and rolled. The work is rather slow due to the scarcity of laborers, and to the difficulty of getting enough transportation for surfacing materials.

Work on the subgrade of the road from the town of Moncada to the town of San Manuel has been started. The road is a part of the Tarlac–North Road now under construction, which begins from the town of Gerona passing through the towns of Paniqui and Moncada to San Manuel, a distance of 23.9 kilometers.

The construction of Tarlac-Camiling Road has been started soon after the fund for same has been made available for expenditure. The work has been started from Camiling towards Tarlac. Because of abundance of laborers in this part of the province, the work on subgrading as well as surfacing is progressing very satisfactorily. The work on grading in Camiling–San Clemente Road which has been opened up on February is progressing satisfactorily, but the work on surfacing is rather slow due to the long haul between the gravel pit and the road to be surfaced.

No bid having been accepted for the construction of Tarlac presidencia, this project is to be done by administration. This building is of the newest type produced by the office of the Consulting Architect, and it is going to be the model for Municipal Buildings in many provinces of the Islands. It is a reinforced concrete structure throughout, 9.40 m. x 22.90 m., and it is to be roofed with the old Spanish style of clay tile. Materials for this building have been requisitioned from Manila and as soon as they arrive the work will be started.

TAYABAS.—Maintenance work has been carried on a more substantial basis during the quarter. Materials and transportation means were much easier to get. Two road rollers have been placed on the Lucena–Sariaya road section and have completed the resurfacing work from Km. post No. 125 to Km. post No. 133. One of the road rollers is proceeding on the resurfacing work on the Sariaya–Candelaria section while the other was shifted to the Sariaya–Bucal Road, when the resurfacing work on the Lucena–Sariaya reached Km. 126. The rock crusher at Sariaya River, Km. 125, has been transferred to Lagnas River at Km. 122. When enough resurfacing materials have been crushed for kilometers 114 to 123, inclusive, the crusher will be shipped to Palsabañgon to be incorporated with the other crusher at work there.

Enough resurfacing materials have been hauled and deposited along kilometers 142 to 153 on the Lucena–Tayabas section and kilometers 141 to 147 on the Lucena–Pagbilao section.

Considerable trouble was experienced on the Palsabañgon Quarry due to the difficulty of keeping sufficient men continuously at work. Malaria fever invaded the camp and as a result fresh laborers had to be continuously recruited and brought in to work. With the present crisis of laborers, the necessary number of personnel can not be found.

After three years of suspension, the construction of the Panaon-Unisan Road was resumed during the last week of February. The subgrade work is being done by the "paquiao" system. The work accomplished so far is the clearing of the surveyed line, as considerable underbrush has grown on the right-of-way.

The entire subgrade of the Tiaong–Dolores Road has been repaired and is now ready to receive surfacing. Every effort will be made to surfacing those sections that will likely get muddy during the rainy season.

After considerable time was spent in reconnoissance surveys, a good location has been found around "Bitocangmanoc." The maximum grade encountered is 5 per cent with resting places at every four hundred meters. After the line has been approved by a representative of the Central Office, construction started immediately. Subgrade has been completed up to Km. 8+000 and broken stones have been spread up to Km. 5+200. It is worthy of mention here the civic virtues and sacrifices displayed by the people of Sampaloc, who not only ceded the right-of-way gratuitously but formally offered voluntary gratuitous labor equivalent to the work of 3,000 laborers. A section has already been staked out at the Sampaloc end to take advantage of the offer. The voluntary work will start on April 21st, right after the Holy Week.

The construction of the Sariaya–Bucal Road has progressed satisfactorily. One road roller has been assigned to this road during the last week of March and as a result 1.5 kilometers of completed road has been added, thus making a total of two kilometers completed. It is expected that the entire road will be completed and, therefore, opened to traffic, by the first week of May, as broken stones have already been spread over the entire uncompleted balance of the road.

The entire 2.5 kilometers length of the road to Lutucan R. R. Station is now ready for rolling, as broken stones have already been spread and the necessary binder has been placed on the shoulders of the road along the entire length.

Due to lack of laborers the progress of the construction of the Lopez Market was very slow. However, the grade fill has been completed and, as soon as it has sufficiently been compacted, the flooring will be poured in. Every effort will be made to turn over the building to the municipal authorities by the middle of next May.

The alteration of the Sariaya School, a Standard Plan No. 7, which consists in putting two additional rooms, has progressed satisfactorily. It is now 70 per cent completed.

Requisitions for materials have been placed for the Unisan School, a Standard Plan No. 7, and the Trade School at Lucena, a Standard Plan No. 8, both projects to be done by administration as no bids were received when they were advertised.

All the pipes on hand for the Lucena–Tayabas Water Works System have been distributed along the pipe lines, with the exception of about two kilometers on the line between the Springs and the Tayabas Reservoir, although the necessary pipes are now deposited around the intersection of the provincial road and the trail leading to the Lalo Springs. Considerable trouble has been encountered in the transportation of the pipes from the provincial road to the pipe line between the Springs and the Tayabas Reservoir, due to the rough and broken up condition of the trail, in which draft animals could not be used, and to the wet and soft condition of the terraced rice paddies through which the haulers of the pipes necessarily had to pass. What pipes have already been transported were done by men who carried them on their shoulders. About two kilometers length of pipes have been carried in this way by voluntary laborers from the Municipality of Tayabas, by the "pabayani"[1] system as is locally called, at a cost of about ₱0.61 per pipe of the 6″ x 16′ size, compared with the ₱7.00 per pipe asked by the other laborers. The cost of ₱0.61 per pipe was incurred to provide for the luncheon, cigarrettes and wine for the voluntary laborers. In order to have all the pipes distributed along the pipe line between the Springs and the Tayabas Reservoir, the Municipal President of Tayabas is making arrangements for another "pabayani". Sand and gravel are now in readiness for the construction of the reservoirs and headworks at the springs. Actual construction will start soon.

MARINDUQUE-SUBPROVINCE.—The maintenance of the first class roads has been carried on satisfactorily. Almost all the depositories have been filled up with gravel to be ready for use during the coming rainy season. Bridges and culverts both permanent and temporary are maintained to meet the demands of all kinds of traffic in the subprovince. The hemp and coconut producers are offering higher labor wages than those approved by the Provincial Board for the common laborers in the subprovince, consequently, it has been difficult to keep the camineros to stick to their job on the roads. For this reason maintenance of the Boac–South Road cannot be placed on an equal standard as the Boac–North Road.

The subgrade work of Mogpog–Balanacan Road has been completed on the fifteenth of March. From the date of its completion until the end of the same month, work has been shifted to those sections of the road where repairs were badly needed. There are still some sections where big rocks can be found and where the use of explosives is necessary. With the balance of the appropriation, surfacing work has been begun from Mogpog, the northern terminal of the present first class roads. The first carromata trip up to

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[1] Gratuitous help. Said of laborers who give free services, for which they are offered extraordinary meals by the employer.

Km. 12 of this road was made by Dr. Damian Reyes, District Health Officer of the subprovince.

In the construction of Sta. Cruz–Torrijos Road, the subgrade work consists partly of side hill cutting and partly of rice paddy filling. In spite of the present high cost of labor and all the difficult conditions encountered in the work, more than one kilometer and a half of subgrading has been finished for less than the ordinary price for subgrading per kilometer formerly worked out on the ground of a like natural feature.

In connection with the construction of Sta. Cruz Water Works, the pipe alignment from the proposed reservoir location near the corner of calles "Rosario" and "Tavera" has been staked out. All the pipes have been distributed along the streets in accordance with the approved B. P. W. plan of the Sta. Cruz Water System. Due to the lack of transportation facilities in the municipality, the distribution of the pipes consumed a little more time and money than what was expected. Only a few pieces of the requisitioned materials necessary in starting the installation of the pipes have been received. In regard to sand none of the materials which would answer the sand specification for concrete work could be located in places near Sta. Cruz. For this reason a requisition was made to secure the necessary quantity needed for hydrant construction from somewhere near Boac.

About nine-tenths of subgrade work on the Buenavista–Malbog Road has been finished up to this time. In this project almost all the laborers are from municipalities other than Buenavista. Very few are from the last named municipality as most of the hands available there are engaged in the hemp and coconut industry in which higher wages are given. It is believed that about the middle of the coming May the subgrade work will reach the Springs of Malbog.

ZAMBALES.—The maintenance gangs on the Iba–South and Iba–North roads are keeping their respective section in fair shape. The worst sections have been filled with dirt, sand and in some places with gravels.

The Calapandayan wooden bridge has been completed and is now ready for cart traffic.

The Iba–Masinloc Road is being improved specially at San Lorenzo Hill section which is almost impassable during the rainy season. An allotment of ₱11,142 has been received during the early part of the year for this purpose. 2.426 Km. were graded and .485 Km. were surfaced with coral rocks. Two single pipe culverts with boulders for headwalls have been completed. Some of the gaps require a 3 meter fill.

The construction of Castillejos–San Marcelino first class road has been very slow during the first quarter due to the scarcity of laborers and carretoneros to haul gravel and binder.

Materials for the construction of telephone lines have been ordered. Bamboo posts are being cut under administration. Installation will be started at once when the materials are received from the Bureau of Supply.

Materials for Cabangan and Botolan Central School Buildings, Plan No. 7, remodeled and adopted for wooden construction, have been ordered. At Cabangan 11 long and 14 short posts and 111 assorted pieces of sawed lumber for framing were cleaned and made ready for use.

A completely new line was surveyed for the final location of the Subic Hill Road. The old line was abandoned due to its uneconomical alignment. All of the land owners donated their lands for the necessary right-of-way. 51 concrete pipes having a diameter of .60 m. were cast.

An allotment of ₱26,000 has been received for the construction of Subic-Bataan Boundary first-class road. Survey will soon be started.

ZAMBOANGA.—A No. 2 wooden school building was recently completed in the barrio of Taluñgatong by contract for the sum of ₱3,135. Clay tile roofing was used which gives the building a very neat and attractive appearance.

A jet well rig has been requisitioned from the Bureau of Public Works. The province will operate the rig in some of the outlying municipalities which are inaccessible to a large deep well rig and charge the municipalities the actual cost of drilling operations.

An Insular allotment of ₱30,000 has been received for the reconstruction of the Zamboanga–San Ramon Road. The heavy truck and buss traffic on this road has so rutted and worn the surfacing that every sensation of traveling over a corduroy road is experienced in passing over some sections. Resurfacing will be begun on the worst portions in the immediate future.

Contract has been awarded to Mr. C. V. Powers for the construction of the exterior portion of a standard No. 10 concrete school building in the municipality of Dipolog. There were insufficient funds available to include floors, ceilings and partitions, but it is expected that funds will be provided for these items by the time the exterior portion of the building is completed.

A provincial appropriation of ₱15,000 has been made available for continuing the work on the Manikaan–Bolong section of the Zamboanga–East coast road. The greater portion of the road is through very rough country requiring heavy cuts and fills. It is hoped to complete the subgrade and open the road as a third class road before the end of the year. This will allow wheeled traffic to reach Bolong a distance of 37 kilometers from Zamboanga.

A contract has been awarded to Don Robinson for furnishing 450 poles for the transmission line of the Zamboanga hydro-electric installation. The poles are to be of Bacauan Lagting or the heartwood of Bacauan which with treated butts are expected to be serviceable for from 12 to 15 years. The waterwheels and generators for the hydro-electric plant were ordered from the United States during the latter part of 1918 and it is hoped to receive the equipment so that complete installation of the plant can be made during the early part of 1920.

FINANCIAL.

LOANS FOR ROADS, BRIDGES, SCHOOLS, MARKETS, MUNICIPAL AND PROVINCIAL BUILDINGS, WATERWORKS, ETC., FROM JANUARY 1, 1919, TO MARCH 31, 1919.

Provinces and projects.	Act. Nos.		Total.
	1729	1749	
Ambos Camarines:			
Iriga market		₱15,000	₱15,000
Bohol:			
Calape market		22,000	22,000
Pangasinan:			
Asingan market	₱26,000		26,000
Tayabas:			
Boac market (Subprovince of Marinduque)		33,000	33,000
Total	26,000	70,000	96,000

AMBOS CAMARINES.—For the purpose of constructing ten double 4 by 6 market tiendas, a loan of ₱15,000 is hereby granted the municipality of Iriga, Province of Ambos Camarines, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of four per centum per annum.

BOHOL.—For the purpose of purchasing a site and erecting a modern market building thereon, a loan of ₱22,000 is hereby granted the municipality of Calape, Province of Bohol, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest payable quarterly, at the rate of four per centum per annum.

PANGASINAN.—For the purpose of purchasing a site and erecting a modern market building, a loan of ₱26,000 is hereby granted the municipality of Asingan, Province of Pangasinan, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of four per centum per annum.

TAYABAS.—For the purpose of purchasing a site and erecting a modern market building thereon, a loan of ₱33,000 is hereby granted the municipality of Boac, Subprovince of Marinduque, Province of Tayabas, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest payable quarterly, at the rate of four per centum per annum.

APPENDIX A.

PROJECTS ACTIVE APRIL 1, 1919.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	3	3																		2											2		2	12
Agusan	5	5																		2						1					1		6	20
Albay	5	4								1										2				1		1							1	15
Ambos Camarines	5	10		1	1	1	1			1			4							5	1				1	1							3	35
Antique	5	2																		2														9
Bataan	6	4			2		2				1									1													1	17
Batangas	6	4								1									1	4	1			2	1	1		4					11	36
Benguet	9	8						1					1		2					2				1	4	8		3	2		1	2	8	52
Bohol	5	3		1	4						1						1			7					1	1		4					3	31
Bukidnon	2																1			3						1		1			1			9
Bulacan	5	3		3	2															5													3	21
Cagayan	3	2											1							1						1	1						3	12
Capiz	11	2			4															4							1						1	23
Cavite	3	2			2															4				3				1					5	20
Cebu	9	2			2															4		1		4	1	3		6					17	49
Cotabato	10	2			2															2				1		2	1				1		6	27
Davao	9	3			1															1				1	2	5		2			2		8	34
Ilocos Norte	4	2			1															8								1						16
Ilocos Sur	8	3														1		1		2				2		2	1						3	23
Iloilo	10	3	2		1																				1						1		5	23
Isabela	4	2							1				2							5													4	18
La Laguna	6	2	1					1					1							7				2		3		5					4	32
Lanao	4	3		1		1														3											1		3	16
La Union	3	4											1							8				3	1								1	21
Leyte	4	2							1		1		4					1				1		2	1						1		4	22
Mindoro	3	3		1						1			1							2	1							3					1	16
Misamis	6	3																										2					2	13
Mountain Province	5	10			2								7							5				1		2					1	1	14	48
Nueva Ecija	7	2											1							2													6	18
Nueva Vizcaya	2	4		1																6											1		1	15
Occidental Negros	14	2			2																						1						1	20
Oriental Negros	4	5									1		1							2													3	16
Pampanga	7	2		5	2								1							5						1							2	25
Pangasinan	13	3			6				1				2							4				2								1	1	33
Rizal	4	5	1		4		1				1									1						1					1			19
Romblon	3	1									1									1		1												7
Samar	2	2	1																	3				1			1						4	14
Sorsogon	8	2			1			1									1			2				1				1					1	18
Sulu	2	2																		3						1					2		8	18
Surigao	1	2																		3					1			3					1	11
Tarlac	6	3											3		1					1						1								15
Tayabas	11	3									1									2		1		2	2	2		2						26
Zambales	5	3																		2											1			11
Zamboanga	5	3								1										5				1	1								6	22
Total	252	140	5	13	39	2	4	3	3	5	7		30		3	1	3	2	1	133	3	4		30	17	38	6	38	2		17	4	153	958

NOTE.—Of the 153 projects under the caption "Miscellaneous," there are 15 surveys and investigations of roads, bridges, water supply, irrigation system, hydrographies, etc., 6 docks, 25 artesian wells, 1 port work maintenance, 3 maintenance harbor, 8 irrigation systems, 10 wharves, 4 river control, 3 custom houses, 2 dredging projects, 1 dyke project, 2 boundary monuments, 11 constabulary buildings, 3 irrigation ditches, 2 water tanks, 13 hospitals, 1 pier, and 43 of other less important projects.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to April 1, 1919.]

JOSE PAEZ, *Director of Public Works*
C. E. GORDON, *Chief Constructing Engineer*
E. C. EARLE, *Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer*
JUAN ARELLANO, *Supervising Architect*
TOMAS MAPUA, *Supervising Architect*

Supervising Engineers
L. S. Boggess
J. C. Cookingham
C. S. Dandois
Marcial Kasilag
J. T. Marshall
B. F. Mills
A. T. Sylvester

Hydraulic Engineer
G. G. Stroebe

Designing Engineers
Clarence H. Davidson
Paul W. Mack
G. R. B. Symonds
Julian Vallarta
Pedro Siochi

Irrigation Engineers
Luis Francisco
Gonzalo Garcia

Chief Hydrographer
Nicanor Cortes (acting)

Electrical and Mechanical Engineers
L. L. Vincent
L. H. Thompson

Structural Engineers
V. L. Legarda
H. Roy Kingsley

Chief Architectural Draftsman
Cheri Mandelbaum

Supervising Architectural Draftsmen
C. A. Barretto
Antonio Toledo

Architectural Draftsmen
J. Altiveros
Elias V. Felix

Assistant to the Director
C. A. Tansill

Superintendent of Artesian Wells
A. W. Wolf

District Superintendent of Artesian Wells
Wilburn M. Irwin

Chief Accountant
Rosendo Reinoso

Cashier and Disbursing Officer
Teodoro Camu

Division Clerks
Hilario Reynera
Salvador A. Reyes
M. Limlingan
H. Balagot

District Engineers
R. N. Allen
Marcelino Angeles
Alejo Aquino
J. V. Bagtas
Sotero Baluyut
N. R. Baugh
L. S. Boggess
Hilario S. Clemente
J. C. Cookingham
Mamerto Cruz
Chas. S. Dandois
Manuel Diaz
Leandro Espejo
Severino Fernandez
Vicente Fragante
R. S. Frush
Jose Gandionco
Rufino Garcia
Domingo Guanio
W. J. Hollis
W. B. Honska
Leon Ines
Agustin Jereza
V. S. Kilby
Isabelo Lagniton
Fidel V. Larracas
Saturnino Lopez
Jose Lozada
Juan Macaraeg
Graciano J. Militante
B. F. Mills
Vicente Oledan
Vicente Orosa
Lorenzo Ortiz
Mateo Roco
N. S. Saleeby
Valeriano Segura
E. D. Smith
A. T. Sylvester
Antonio Tayzon
L. R. Tillet
Dalmacio Urtula
Jose Villanueva

Assistant Engineers
F. P. Reynolds
Melecio Arranz
A. C. Babcock

Superintendent of Dredges
Vicente Castillo
John T. Bootes

Civil Engineers
L. T. Clark
Pastor Gomez
C. G. Gabelman (on leave)
E. J. Halsema
S. W. Hulse (on leave)
W. A. Newton
Manuel Reyes
A. G. Yankey (on leave)

Junior Assistant Engineer
Jose A. Aldea

Assistant Civil Engineer
Manuel Gonzales

Superintendent of Benguet Auto Line
Pastor Avisado

Junior Civil Engineers
Gregorio Alcantara
Alfonso Altimerano
Jose Arquisola
Gustavo Cruz
Isaias Fernando
Jose F. Imperial
Jaime Laguardia
Vicente F. Lavadia
Luis Mallari
Teodoro Mocorro
Arturo P. Nitorreda
Marcelo Operario
Ambrosio Osmeña
Martin M. Resplandor
Silvestre Tan Chauco
Rafael Ungson
Liborio Urtizberea
Rosalio Villalon
Jose Wright

Junior Electrical Engineer
Vicente Villanueva

Superintendent of Automobiles
Juan Piedad

Property Clerk
Jose de Jesus

Traveling Inspector
Jose del Castillo

Law Clerk
Eusebio Barba (acting)

Record Clerk
Primo Villar

P552
x

JUN 8 1921

BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS
PHILIPPINE ISLANDS

Quarterly Bulletin

VOL. 8 JANUARY 1, 1920. NO. 2

Private and general ward pavillions, Zamboanga General Hospital.

178211

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1919

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, P. I., March 15, 1920.

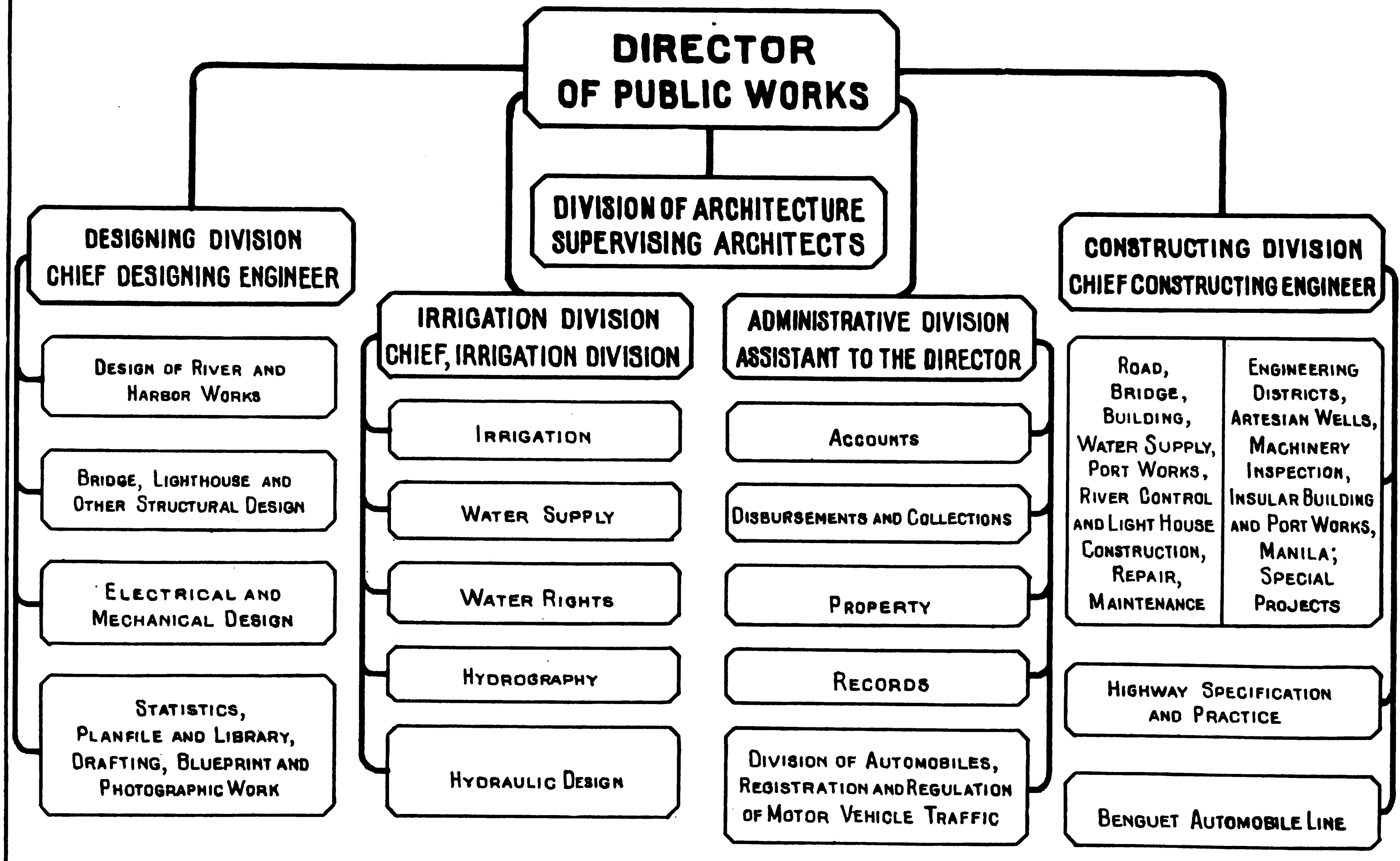
Sir: I have the honor to submit herewith the Report of the Bureau of Public Works for the fiscal year ending December 31, 1919.

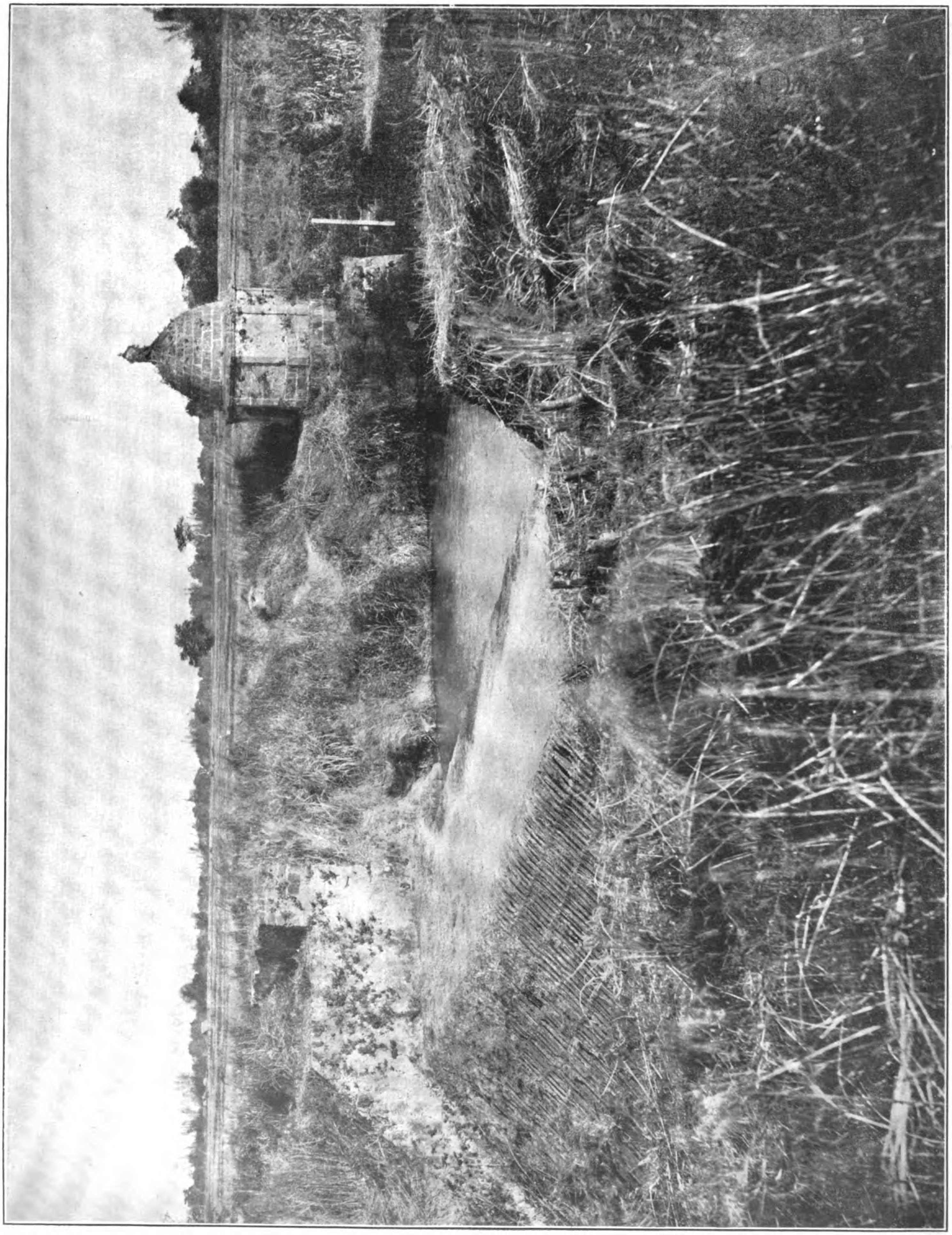
Very respectfully,

JOSE PAEZ,
Director of Public Works.

The Honorable,
THE SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS
DECEMBER 31, 1919.


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
Design of River and Harbor Works
Bridge, Lighthouse and Other Structural Design
Electrical and Mechanical Design
Statistics, Planfile and Library, Drafting, Blueprint and Photographic Work
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
Irrigation
Water Supply
Water Rights
Hydrography
Hydraulic Design
ADMINISTRATIVE DIVISION ASSISTANT TO THE DIRECTOR
Accounts
Disbursements and Collections
Property
Records
Division of Automobiles, Registration and Regulation of Motor Vehicle Traffic
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
Road, Bridge, Building, Water Supply, Port Works, River Control and Light House Construction, Repair, Maintenance
Engineering Districts, Artesian Wells, Machinery Inspection, Insular Building and Port Works, Manila; Special Projects
Highway Specification and Practice
Benguet Automobile Line



Old dam and headgate to control entrance of water into friar lands, Cavite Province.

QUARTERLY BULLETIN

BUREAU OF PUBLIC WORKS
MANILA, P. I.

ISSUED QUARTERLY UNDER THE DIRECTION OF
THE DIRECTOR OF PUBLIC WORKS

G. A. RICO, COMPILER

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ORGANIZATION AND PERSONNEL.

The termination of the Great War in the early part of the year and the subsequent release of the Bureau of Public Works' engineers from the training camps both in the United States and in the Philippines, and their return to the service relieved partially the acute shortage of technical personnel of the Bureau, and made it possible to cope, to some extent, with the huge public works program of the Government. Another factor which also contributed to a certain extent to the realization of most of the construction work was the release of shipping which was no longer required for the prosecution of the war; the supply of building materials from the United States being thus, at least, partially assured.

The shortage of engineers and architects has greatly handicapped the Bureau in carrying out, in its entirety, the present vast public works program and will, no doubt, delay the execution of many projects. Its effect will be more keenly felt in the coming year in case the present situation is not improved or remedied.

Due to this shortage in technical personnel, the Bureau has been unable to make a study of the future public works improvements which might be a great importance to the economic development of the Islands; the attention of the Bureau being entirely absorbed by the present public works projects.

In justice to the entire personnel of the Bureau it must be said, however, that every engineer and employee has put forth his greatest effort to the end that the large shortage of technical personnel might not cause the Bureau embarrassment in the carrying out of this year's program.

The efforts of the Bureau to retain the services of some of its old and experienced engineers and to secure additional technical men from outside, has been in most instances, fruitless, due to the higher salaries offered to engineers by private concerns which, in view of the boom in business, resulting from the termination of the war, are, themselves, very badly in need of the services of technical men.

In order to place the Government on at least the same footing as private concerns, it is very essential that the present salary law be so amended as to give better and commensurate remuneration to technical men in the government service.

PERSONNEL.

Number of employees paid direct from bureau funds as of December 31, 1919. Americans, 40; Filipinos, 317.

NOTE.—The corresponding figures for December 31, 1918, are 62 and 379 respectively.

Number of technical employees as of December 31, 1919. Americans, 31; Filipinos, 121.

American technical employees.

	Classified.	Unclassified.	Total.
Civil engineer	19	4	23
Assistant engineer	1	1	2
Electrical mechanical engineer	3	0	3
Steel bridge designer	1	0	1
Surveyor	1	0	1
Architectural draftsman	1	0	1
Total	26	5	31

Filipino technical employees.

	Classified.	Unclassified.	Total.
Civil engineer	26	0	26
Assistant civil engineer	15	8	23
Junior civil engineer	7	17	24
Surveyor	3	2	5
Junior surveyor	1	0	1
Junior electrical engineer	2	0	2
Supervising architect	0	2	2
Architectural draftsmen	12	1	13
Senior architectural draftsman	0	0	0
Junior architectural draftsmen	14	3	17
Supervising architectural draftsmen	2	0	2
Assistant architectural draftsmen	4	0	4
Superintendent of autos	1	1	2
Total	87	34	121

CHANGES IN PERSONNEL.

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau, by whatever branch of the Government paid.

	Americans.	Filipinos.	Total 1919.	Total 1918.
Number of appointments	13	535	548	350
Number of transfers to Bureau	2	23	25	12
Number of separation for cause	0	10	10	14
Number of voluntary resignations	4	163	167	180
Number of separation due to economy	0	0	0	2
Number of transfers from Bureau	0	16	16	24
Number of separation due to retirements	9	1	10	3
Number of deaths	1	6	7	6
Total number of employees as of December 31, 1919	29	754	783	591

NOTE.—Item "number of appointments" includes new appointments and probational appointments. The apparent increase of appointments is due to the additional technical, semi-technical and clerical personnel appointed during the year.

An examination of the following report of work accomplished by the various divisions of this Bureau will show that in spite of the serious difficulties met during the past year both as regards personnel and the availability and high cost of building materials, the results obtained during the year can be favorably compared with previous records; in fact the kilometerage of roads constructed during 1919 was much larger than in any previous year since 1916; the number of buildings finished in 1919 exceeded those constructed in 1918. Steps looking towards the early construction of extensive irrigation systems were never before so actively undertaken; with the attendant result that actual construction on various systems will be started and prosecuted during the year 1920. Last, but not the least, extensive and difficult preparatory work for the actual construction of Pier No. 7, which will be the largest and most modern pier in the Orient, to cost complete, about three and three-quarter million pesos, was another important feature of the Bureau's accomplishments during 1919.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS.

Item.	Insular expenditures.				Provincial and municipal expenditures.		Funds from private sources.		Total.	
	Bureau of Public Works.		Appropriations controlled by other bureaus.							
	1918	1919	1918	1919	1918	1919	1918	1919	1918	1919
Roads and bridges	₱93, 117. 95	₱147, 168. 97	₱3, 003. 86	₱7, 939. 18	₱7, 161, 794. 89	₱8, 810, 557. 94		₱335. 46	₱7, 257, 916. 70	₱8, 966, 001. 55
Buildings	237, 570. 23	1, 560, 422. 13	402, 706. 17	256, 576. 21	1, 792, 492. 55	2, 566, 896. 27		3, 676. 67	2, 432, 768. 95	4, 387, 571. 28
Maintenance, alteration and repair of public buildings	223, 415. 58	320, 784. 18	50, 259. 12	62, 272. 44				21, 896. 96	273, 674. 70	404, 953. 58
River and harbor work including purchase and reconstruction of equipment, lights, buoys, and beacons	1, 051, 984. 44	1, 042, 333. 27	23, 108. 31	543, 006. 40	29, 728. 38	23, 026. 05	₱24, 370. 81	52. 73	1, 129, 191. 94	1, 608, 418. 45
Artesian wells and water supply	845, 709. 14	542, 797. 27	30, 699. 38	41, 182. 35	266, 944. 63	792, 624. 42	2, 427. 00	5, 995. 07	1, 145, 780. 15	1, 382, 599. 11
Irrigation projects	90, 210. 43	232, 404. 28	28, 704. 83	43, 511. 03	419. 47	300. 33	946. 84	1, 522. 22	120, 281. 57	277, 737. 86
Operation of auto lines, quarries, and supervision of motor vehicle traffic	252, 599. 63	338, 112. 63							252, 599. 63	338, 112. 63
Miscellaneous	62, 189. 08	6, 941. 51	168, 213. 36	122, 536. 12	702, 005. 09	278, 592. 32	48, 747. 34	37, 824. 61	981, 154. 87	445, 894. 56
Total	2, 856, 796. 48	4, 190, 964. 24	706, 695. 03	1, 077, 023. 73	9, 953, 385. 01	12, 471, 997. 33	76, 491. 99	71, 303. 72	13, 593, 368. 51	17, 811, 289. 02

BALANCE SHEET, BUREAU OF PUBLIC WORKS.

		1918.		1919.
Current assets:				
Cash (collecting and disbursing officers)		₱383,270.17		₱523,405.14
Supplies and materials		469,050.25		673,022.26
Work in process				22,962.99
Accounts receivable		612,687.55		1,049,563.70
Investment and securities		400.00		400.00
Prepayments		4,980.97		2,990.83
Fixed assets:				
Real property and improvements [a]		22,997,157.17		25,567,879.51
Equipment	2,100,634.80		₱2,240,660.99	
Less depreciation	1,194,127.52		1,190,001.88	
		906,507.28		1,050,659.11
Total		25,374,053.39		28,890,883.54

	1918.	1919.
Curren liabilities:		
Treasury account	₱1,120,628.09	₱2,257,412.03
Accounts payable	225,523.80	661,863.41
Accrued leave payable	100,181.75	143,112.58
Deferred credits to income	24,060.30	23,316.01
Surplus:		
Appropriated surplus		(813,359.11)
Principal account surplus (fixed assets)	23,903,664.45	26,618,538.62
Total	25,374,053.39	28,890,883.54

[a] All previously completed Insular improvements taken up under fixed assets.

STATEMENT OF APPROPRIATION, INCOME AND EXPENSE, JANUARY 1 TO DECEMBER 31, 1919.

DEBIT.	1918.	1919.
Reversion of unexpended balance of administrative appropriation	₱133,603.79	₱226,207.31
Reversion of receipts	580,714.20	821,926.79
Operating expenditures offset by receipts	2,714,394.66	4,813,359.11
Expenditures administrative appropriation	691,126.56	969,231.69
Outlay purchase of equipment	24,923.90	50,000.00
Balance brought forward to 1920		(813,359.11)
Total	4,144,763.11	6,067,365.79

CREDIT.	1918.	1919.
Appropriation of administrative expense of Bureau of Public Works (expenditures partially offset by surcharge collected)	₱851,120.00	₱1,245,439.00
Overdraft incurred in the direct operation account		(813,359.11)
Balance brought forward from prior fiscal year	(1,465.75)	
Receipts—Prime cost	2,714,394.66	4,813,359.11
Receipts—Surcharges	503,252.89	714,726.53
Receipts—Miscellaneous	41,798.59	43,558.31
Gain on supplies sold	2,825.73	3,669.88
Inventory—Adjustments	3,213.39	5,215.88
Income from rentals	22,943.03	32,604.35
Interest on investment and securities	180.00	280.00
Sales of fixed assets	6,030.11	11,771.21
Prior year's credit	470.46	10,100.63
Total	4,144,763.11	6,067,365.79

TRANSACTION AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) DURING 1919.

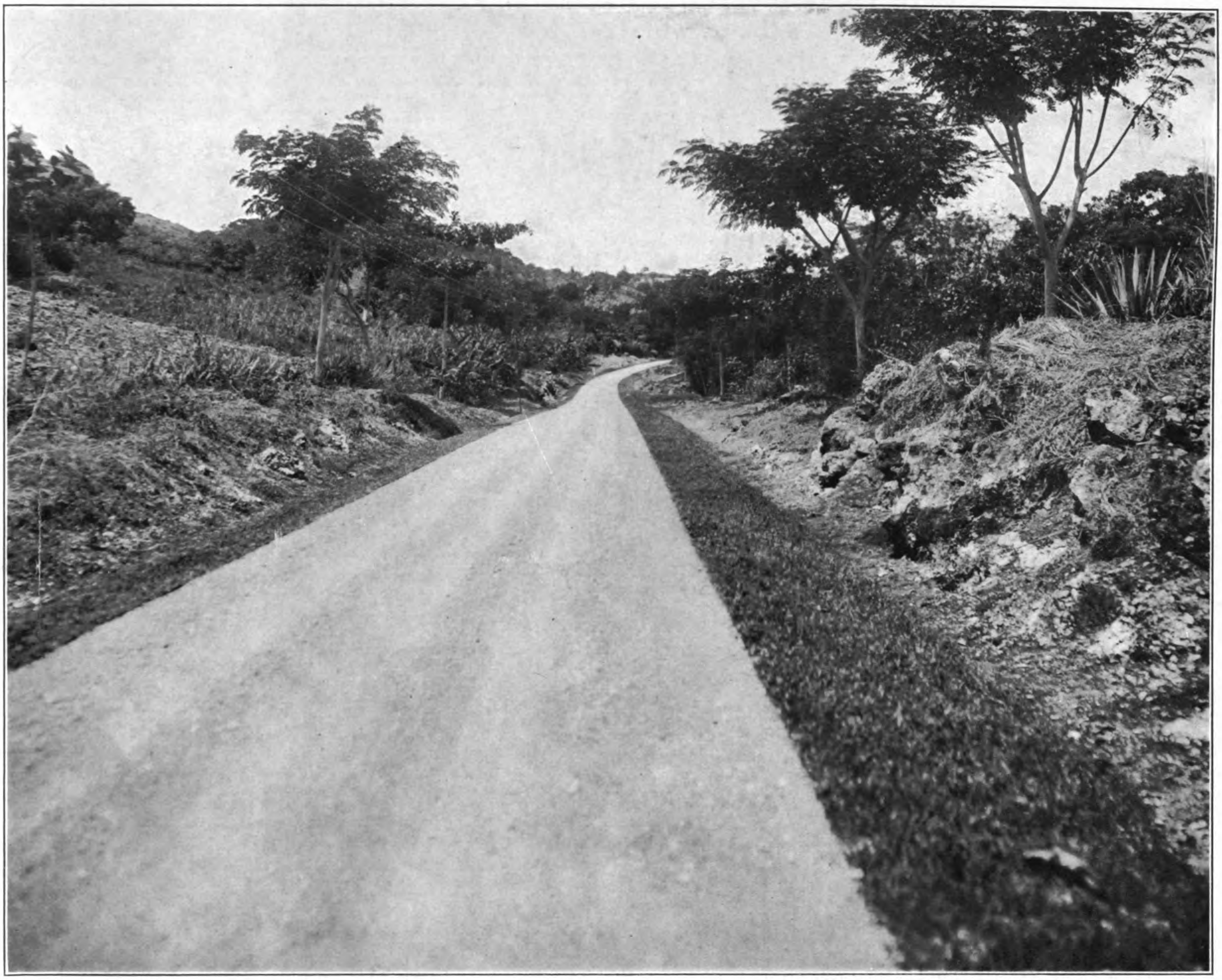
DEBITS.	1918.	1919.
Principal account surplus, December 31, 1918	₱22,719,115.22	₱23,913,654.68
Purchase of equipment	24,923.90	50,000.00
Equipment acquired by transfer	5,333.62	397.43
Fixed property brought into account	1,303,370.86	2,699,679.28
Equipment found at station	348.01	179.11
Equipment acquired by construction		416.17
Total debits	24,053,091.61	26,664,326.67

CREDITS.	1918.	1919.
Equipment sold	₱5,974.85	₱11,655.72
Equipment condemned and dropped	29,003.36	37,858.31
Equipment dropped by transfer	71,938.59	290.59
Equipment transferred to supplies	536.38	
Equipment issued to jobs	438.16	99.07
Depreciation written off	41,535.82	(4,115.64)
Principal account surplus, December 31, 1919 (As per balance sheet, December 31, 1919)	23,903,664.45	26,618,538.62
Total credits	24,053,091.61	26,664,326.67

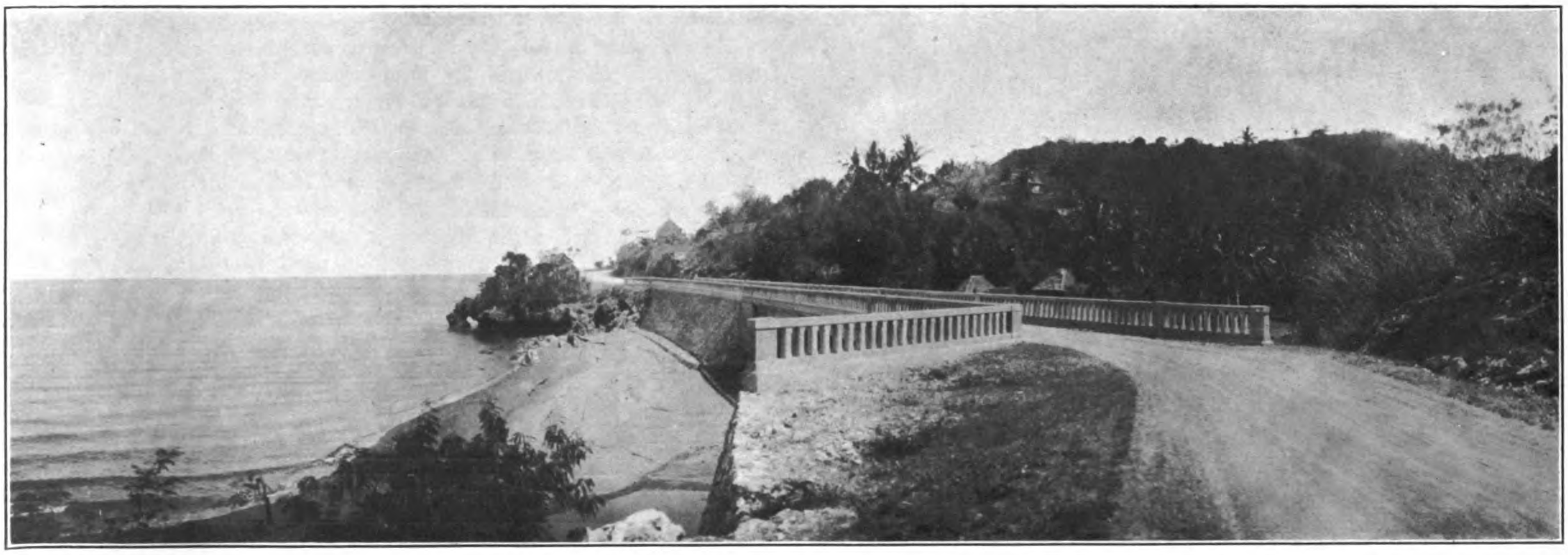
OPERATION STATEMENT, BUREAU OF PUBLIC WORKS.

DEBITS.	1918.	1919.
Operating revenue:		
Rentals	₱22,943.03	₱32,604.35
Surcharges	503,252.89	714,726.53
Gain on goods sold	2,825.73	3,669.88
Interest on investments and securities	180.00	280.00
Inventory adjustments	3,213.39	5,215.88
Other service income	42,269.05	53,658.94
Net loss for the year being aid to local governments	112,581.07	155,169.53
Total	687,265.16	965,325.11

CREDITS.	1918.	1919.
Operating expense:		
Supervising, technical, and clerical service	₱501,460.08	₱765,197.61
Labor	38,717.79	49,210.58
Consumption of materials	61,028.19	62,041.23
Rental of buildings	13,661.46	13,620.00
Illumination and power service	9,277.01	9,500.25
Traveling expenses of personnel	27,099.03	26,610.45
Repair service	23,564.62	18,305.86
Postal, telegraph, telephone, and cable service	8,569.97	10,836.86
Other expenses	3,887.01	10,002.27
Total	687,265.16	965,325.11

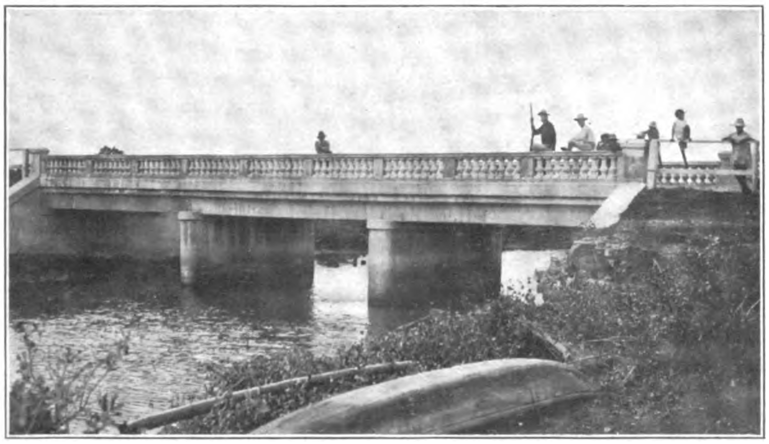


Km. 47, Cebu-North Road. Part of section to be recommended for Estrella Auto Palace Michelin Road Maintenance Prize.



The Panalipan Bridge. Over Macumbucine River. Km. 48.1. Cebu-North Road Maintenance. Province of Cebu.

Constructing Road through a low country, Cagayan-West Road, Misamis District.



Calero (now "Soriano") Bridge, 3-7 m. spans on pile bents, Cavite Province.

THE LARGER RESULTS OF THE YEAR'S WORK.

Surfaced roads constructed and designated first class	kilometers	410.1
Reinforced concrete bridges and culverts completed (In this figure, concrete pipe culverts are not included)	number	46
Successful deep wells completed	number	163
Reinforced concrete buildings completed, including only buildings of over 100 cubic meters capacity	number	37

EXPENDITURES SUPERVISED DURING THE YEAR.

		Compared with 1918 this is an increase of—
Total expenditures	₱17,811,289.02	
		Per cent.
Total expended upon road and bridge work	₱8,966,001.55	23.5
Total expended upon building work	4,792,524.86	77
Total expended upon port works	1,608,418.45	42.4
Total expended upon water supply	1,382,599.11	20.6
Total expended upon irrigation projects	277,737.86	130.9

Expenditures on miscellaneous items account for the balance.

ROAD WORK.

Length of road in existence.

	December 31, 1918.	December 31, 1919.
	Kilometers.	*Kilometers.*
First class	4,090.2	4,500.3
Second class	2,015.8	1,986.0
Third class	3,128.7	3,109.2
Total	9,234.7	9,595.5

Relation of first-class road construction and maintenance.

Fiscal year ending December 31—	Designated first-class road at end of year.	First-class road constructed during year.	Average maintained throughout the year by the caminero system.
1915	3,064.0	499.5	2,732.4
1916	3,436.2	368.5	3,226.8
1917	3,738.7	299.1	3,616.1
1918	4,090.2	351.5	4,023.4
1919	4,500.3	410.1	4,444.2

The term "designated first-class road" means surfaced road maintained by the caminero (cantonnier) system under specific agreement between the Insular Government and each separate province.

DEFINITIONS FOR ROAD CLASSIFICATIONS.

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing.

	December 31, 1918.	December 31, 1919.
	Kilometers.	*Kilometers.*
Stone	1,380.7	1,452.9
Gravel	2,838.0	3,067.0
Coral	1,127.6	1,247.2
Unsurfaced	3,888.4	3,828.4
Total	9,234.7	9,595.5

ROAD MAINTENANCE.

Average number of kilometers maintained.

	1918	1919
Caminero system	4,023.4	4,444.2
Gang system	2,773.5	3,152.5
Total	6,796.9	7,596.7

Total cost of road maintenance.

	1918	1919
Caminero system	₱2,756,810.70	₱3,223,119.18
Gang system	589,450.32	696,440.38
Total	3,346,261.02	3,919,559.56

Average cost of maintenance por kilometer per year.

	1918	1919
Caminero system	₱685.19	₱725.24
Gang system	212.58	220.92

The length of road designated first class and the length of road under caminero maintenance are as nearly identical as conditions permit.

The higher cost as compared with the previous year may be attributed partially to increased labor and material costs but largely to the destructive effect on highways of heavy motor traffic and the rapidly increasing number of motor vehicles.

BRIDGES.

Durable bridges and culverts in existence.

Fiscal year ending December 31—	All durable structures.	
	Total number.	Increase during year.
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	56
1919	7,491	65

NOTE:—The term "Durable Bridges and Culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The increase in the number of structures is not indentical with the number of structures built, not only because with the extension of the work of the Bureau to new territory the old work existing is reported for the first time, but also because of the occasional loss of a structure. The above figures are obtained from semi-annual reports of district engineers.

Reinforced concrete structures in existence.

Fiscal year ending December 31—	Total number.	Total meter span.
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672
1919	4.276	16,714

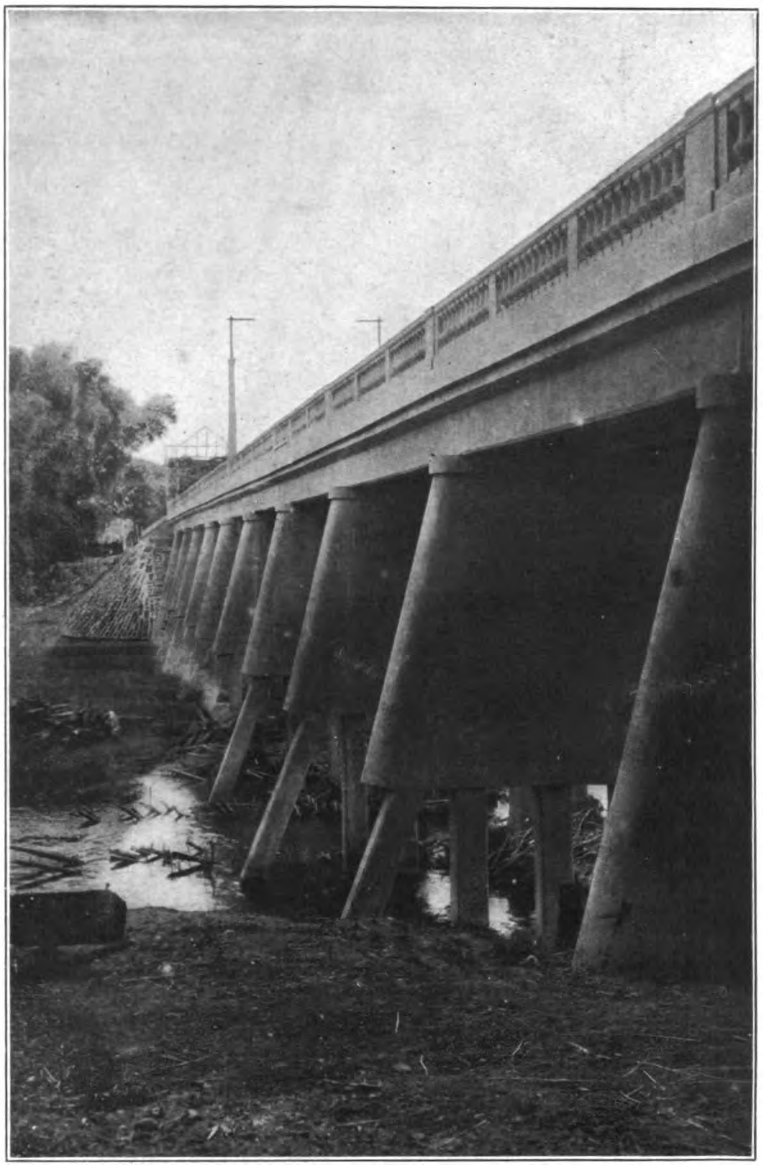
NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other classes of construction.

BUILDINGS.

The figures in the tabulation below exclude all structures of less than 100 cubic meters in content:

All durable buildings completed.

Fiscal year ending December 31—	Total number.	Total content cubic meter.	Per cent reinforce concrete by content.
1915	154	522,746	76
1916	112	261,496	85
1917	82	160.888	70
1918	84	220,943	56
1919	76	159,254	64



The downstream half of Buendia Bridge, Bulacan, showing the inclined pile bents which serve to resist the action of the strong floods. During its construction on August of this year the flood waters have reached the floor level of several completed spans without showing a manifest weakening of its substructure.

Caloocan Artesian well, Rizal.

New Provincial Capitol Building, Tacloban, Leyte Province.

Buildings, in these tabulations, are classified as reinforced concrete when the outside walls, or, in the case of markets the interior posts, are of that material.

Number of markets and schools completed.

Calendar year.	Markets and tiendas.	Schools.
1915	54	72
1916	17	67
1917	15	32
1918	19	27
1919	11	19

ARTESIAN WELLS.

Successful deep wells driven by fiscal years.

1915	139
1916	122
1917	108
1918	165
1919	163

A total of 1,056 artesian wells are now supplying potable water to the inhabitants of the Philippines.

Total expended upon wells, 1919.

	1919		1918	
	Pesos.	*Per cent.*	*Pesos.*	*Per cent.*
Successful wells	344,959.96	93	274,936.79	82
Unsuccessful wells	27,383.41	7	59,278.25	18
Total	372,343.37	100	334,215.04	100

Average cost of drilling per meter: 1919, ₱30.29; 1918, ₱25.22.

Sumary of deep well driving 1919.

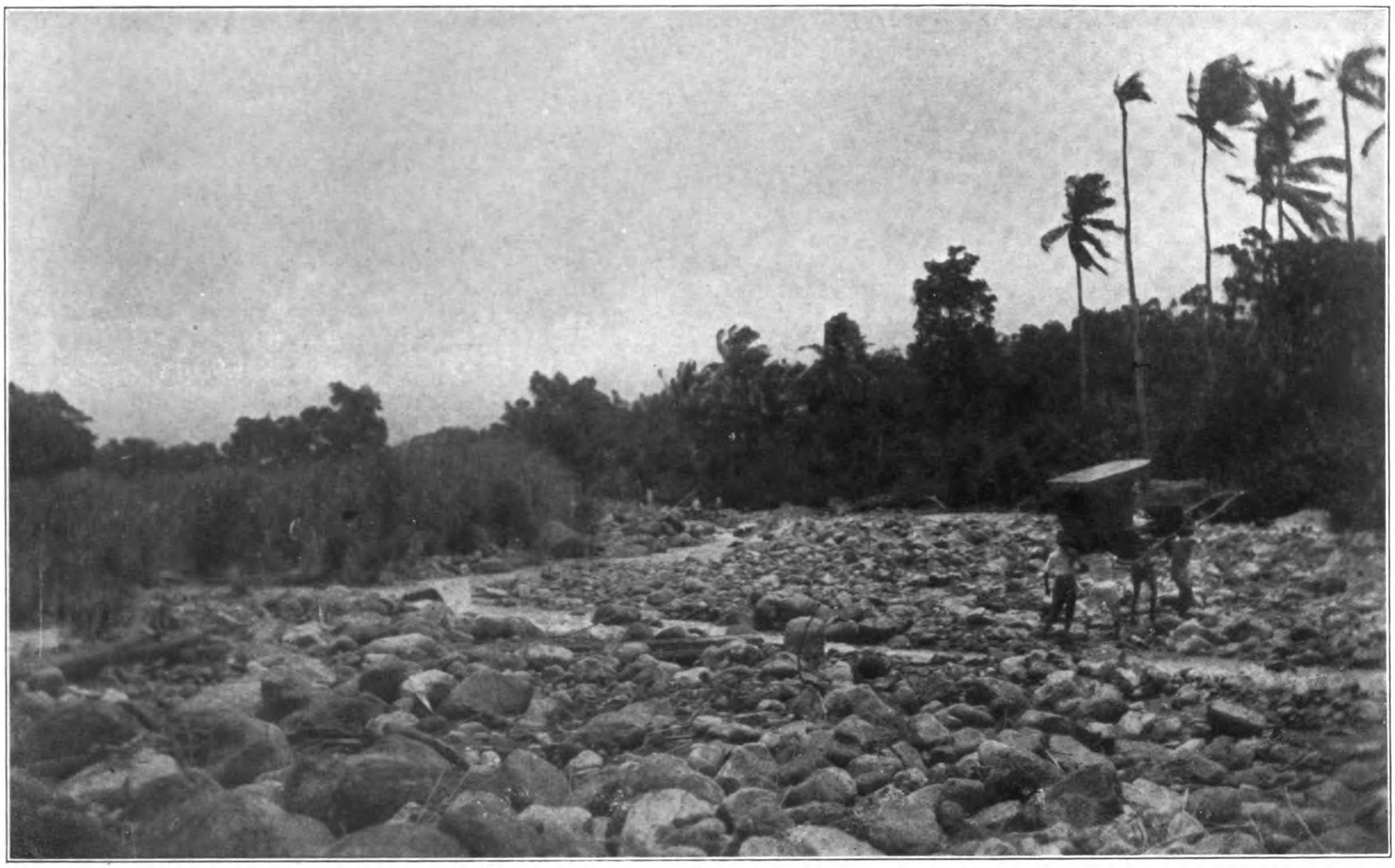
	Number.	Total depth in meters.	Total flow in liters per minute.
Successful:			
Flowing	48	7,690	6,305
Pumping	115	4,753	9,480
Total:			
Successful	163	12,448	15,785
Unsuccessful	13	1,273	....

Percentage of unsuccessful wells drilled: 1919, 7; 1918, 8.

The year 1919 marked a successful year for the Artesian Wells Department. One hundred and seventy-six wells were drilled, all of which but thirteen were successful. The successful wells furnish potable water to a population of approximately 250,000. They were very carefully located, so that the greater part of the inhabitants are benefited. Four of these wells are private, three of which belong to the city of Manila, and which are a part of the nine wells requested.

Drilling operations in 1919 began with twenty-three drilling machines in the field; but owing to the great demand for wells in the different provinces, the Bureau was compelled to reconstruct two old machines which had been stored in the Property Division for lack of essential spare-parts. These machines were ready for operation by the middle of the year.

With the two newly arrived machines from the United States, there are at present twenty seven drilling machines in the field.



Manila–South Road, Km. 124, after the July and August *typhoons*, Tayabas Province.

What was once a macadamized first-class road, is now a bed of loose big boulders and rocks. Horse driven vehicles passing over this section have to be hauled by men as shown in the picture.

In the Province of Laguna very excellent results have been obtained; there having been drilled 10 successful wells during the year.

The average cost of drilling the wells in 1919, including materials and supplies, depreciation of equipment and other charges, such as labor, transportation, etc., was ₱30.29 per meter or ₱9.23 per foot, which is believed to be satisfactory considering the high cost of labor, materials, and supplies.

MOTOR VEHICLES.

The automobile equipment of the Central Office includes 23 touring cars and runabouts of various makes and 12 trucks. These cars are in constant use, being employed not only in the activities of the Bureau but also under regular assignment to the Executive Bureau, the two branches of the Legislature, the Philippine National Guard, and the Department of Commerce and Communications. A great amount of transportation, other than that on regular assignments, has been furnished to many other branches of the Insular Government. The total operating cost for the Manila Automobile Division was ₱70,000 and ₱12,050.25 of this amount is properly chargeable to other Bureaus for transportation furnished.

With the exception of seven very old touring cars and runabouts and 2 trucks which must be sold at public auction, the entire automobile equipment of this Bureau is in good working condition.

The four new "Chandler" cars purchased by the Bureau during 1919, have proven to be difficult to maintain and their service has not been very satisfactory.

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year 2,103 new motor vehicles were registered, representing an increase of 29 per cent over the number of vehicles registered in the previous year which amounted to 7,310. The total number of motor vehicles registered and re-registered is therefore 9,413.

Anent the licensing of motor vehicle drivers, 3,800 applicants were examined and 3,173 new licenses issued. Eigth thousand one hundred fifty drivers' licenses were renewed; the total number of drivers' licenses issued being, therefore, 11,323.

ACCIDENTS AND FINES.

The number of accidents investigated by this Office amounted to 27, and the number of charges filed in the various courts for violation of automobile laws, 72; and the amount of fines imposed is ₱2,525.58. Fifty-eight licenses have been suspended and one revoked.

COLLECTION.

The funds collected during the year under existing laws amounted to ₱113,909.11.

FUNDS.

The original amount appropriated for the registration of motor vehicles for the year 1919, was ₱40,000. Due, however, to the increased activity of the Automobile Division developed during the year, an additional appropriation of ₱30,000 was requested and approved.

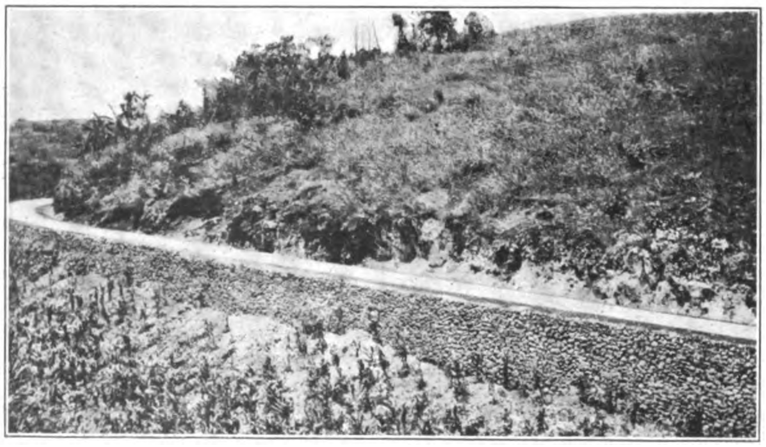
It is recommended that owner's licenses to drive motor vehicles now issued free of charge to persons having registered one or two automobiles in their name, as well as Government licenses issued in the same manner to heads of Bureaus or Offices, be abolished. Licenses should be secured by the payment of two pesos the same as licenses issued to professional drivers. In other words, it is recommended that no licenses be issued free of charge.

Attention is invited to the desirability of amending the present motor vehicle law so that a more equitable application of the cost of maintenance of the roads may obtain. The registration fees are too low and such that the motor vehicle owners fail to pay their just and proper share of road use. Metal tires should not be per-

Km. 74, Logo–Taboilan Road, under construction, Cebu Province.

mitted upon the roads; these tires should be prohibited equally with the narrow tire which has been prohibited for years. The permissible gross load should be reduced to not to exceed four metric tons.

The Bureau is spending over ₱10,000 a year for number plate furnished "free" to motor vehicles. It is recommended that motor vehicles owners be required to pay ₱1 for each number plate issued to them.



Km. 72, Logo–Taboilan Road, under construction, Cebu Province.

To prevent drivers of motor vehicles from being reckless and to minimize the number of accidents that take place every day, the present automobile laws should be amended so as to provide for heavier penalties for the violators.

BENGUET AUTOMOBILE LINE.

The motor vehicle equipment of this line consisted of ten touring cars, seven passenger cars and five freight trucks. The volume of traffic handled by this line during the year can be judged by the in-

The Benguet auto line handled from January 1 to December 31, 1919.

	First class passenger.	Second class passenger.	Hand baggage.	Express and Freight.
			Kilos	*Kilos*
January 1 to March 31	585	1,009	17,260	301,325
April 1 to June 30	1,264	1,561	52,860	344,098
July 1 to September 30	198	370	6,120	178,803
October 1 to December 31	463	985	17,980	381,031
Total	2,510	3,925	94,220	1,205,257

Cebu–North Prize Road, Km. 21, Cebu Province. Part of section to be recommended for Estrella Auto Palace Michelin Road Maintenance Prize.

crease of about 17 per cent for passengers and 35 per cent for express and freight over the 1918 figures.

THE PRESENT USE OF THE BENGUET AND NAGUILIAN ROADS.

Because of the imminence of the abandonment of the Benguet Road, a comparison of the traffic over it, with the traffic passing on the Naguilian should be of especial interest.

Summary of traffic over the Benguet and Naguilian roads for 1919.

BENGUET.	Pedestrians.	Bull carts.	Animals led or ridden.	Calesas.	Motorcycles.	Auto passengers.	Auto trucks.	Wagons.
January 1 to March 31	2,161	2,226	1,138		19	553	481	2
April 1 to June 30	2,040	2,055	976		23	937	14	
July 1 to September 30	1,021	514	1,167		8	425	483	10
October 1 to December 31	2,253	1,432	2,280	1	22	828	2,533	
Total	7,475	6.227	6,161	1	72	2,743	3,511	12
NAGUILIAN.								
January 1 to March 31	6,312	4,717	585	8	53	924	711	6
April 1 to June 30	5,099	2,574	289	2	40	1,337	2,285	11
July 1 to September 30	2,974	1,983	351	6	45	383	929	88
October 1 to December 31	2,599	1,983	382		33	676	778	135
Total	16,984	10,531	1,607	16	171	3,320	4,708	240

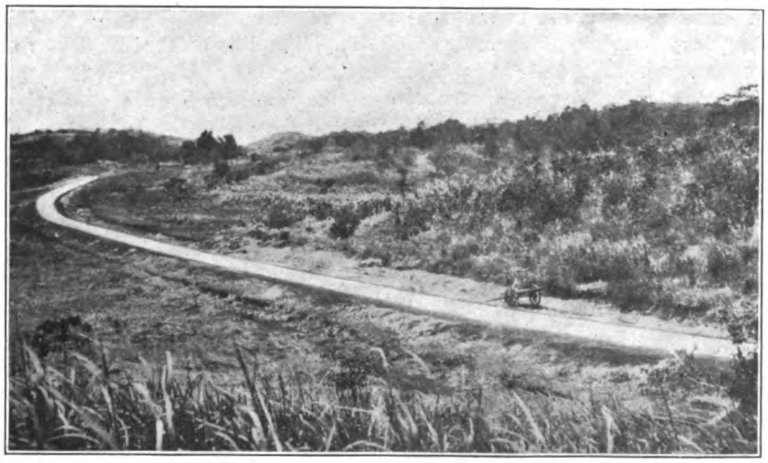
It will be noted from the above summary that during the year 1919 most of the traffic between Baguio and the lowlands passed over the Naguilian Road.

CONSTRUCTING DIVISION.

MARCIAL KASILAG, *Acting Chief Constructing Engineer.*

ROADS.

Through the unusually large Insular appropriation for the construction and maintenance of public highways in the year 1919, amounting to ₱5,720,000, the extension of the first-class road system in all provinces was given impetus during the year. As



Another view of Km. 74, Logo–Taboilan Road, under construction.

Construction of Ilagan–Naguilian–Cauayan Road on Km. 1.0–2.0. Isabela Province.

a result of this big appropriation, the following increase in the kilometerage of first-class roads was obtained: Bohol, 40.8 kilometers; Cebu, 30.3 kilometers; Oriental Negros, 26.7 kilometers; Pangasinan, 25 kilometers; Misamis, 21.4 kilometers, and Tarlac, 20.3 kilometers. The other provinces had each an average increase of approximately 7.4 kilometers. The total increase throughout the Islands amounted to 410.1 kilometers as compared with 351.5 kilometers in 1918. Against this increase in 1919, however, it might be of interest to mention also the damages done on various roads in a number of provinces, by the series of typhoons which occurred during July and August, to wit:

	Estimate of damages sustained by roads.
Bataan	₱12,500
Benguet	33,000
Bohol	20,000
Bulacan	134,440
Cavite	80,000
Cebu	60,000
Ilocos Norte	20,500
Ilocos Sur	21,000
Iloilo	17,547
Laguna	30,000
La Union	20,000
Mountain Province	7,000
Nueva Ecija	22,200
Pampanga	40,000
Pangasinan	40,000
Rizal	50,000
Tarlac	73,300
Tayabas	30,000
Total	711,487

Among the most important road projects greatly benefited by Insular allotments, the following may be noted:

The Logo–Taboilan Road, Cebu Province, total length, 21 kilometers; Insular allotment, ₱80,000. Nine kilometers of this road have been built and declared first class on December 31, 1919. It connects the east and west coasts on the northern part of the Island of Cebu, traversing a beautiful rolling country suitable for the raising of corn.

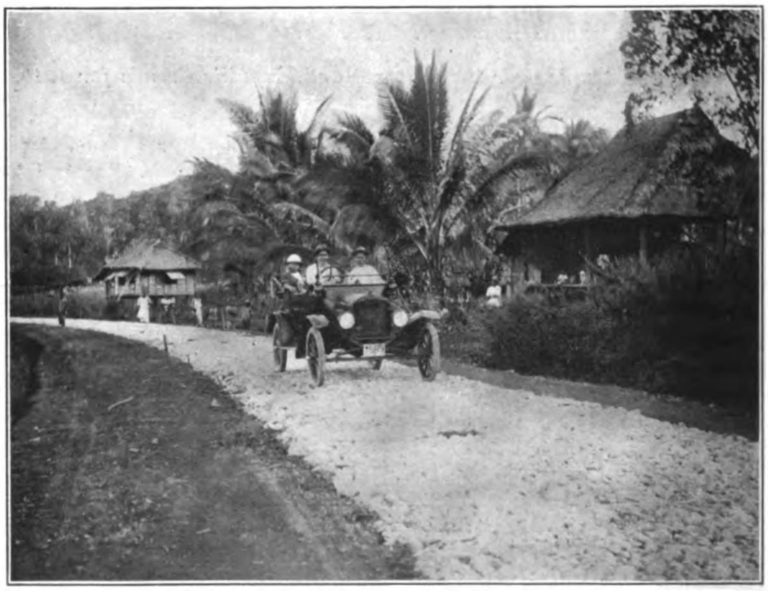
The Antique–Iloilo Interprovincial Road, 23.5 kilometers in length; Insular allotment, ₱80,000. With this amount it was made possible to open the road to automobile traffic as far as Km. 21 on the Antique side, and to Km. 63 on the Iloilo side. It has been estimated that this much needed highway connection between the two provinces would finally be established before the close of the year 1920.

The Antique–Capiz Interprovincial Road, 13.5 kilometers in length; Insular allotment, ₱25,000. The subgrade construction on the Antique side and all but 1 kilometer of the subgrade of the Capiz section, have been finished, and surfacing work started.

The Isabela–Guijulngan Interprovincial Road, Occidental Negros, about 32 kilometers in length; Insular allotment, ₱40,000. The location survey of the mountain section of this road is well underway and will be completed in the early part of 1920. The grading work has been started from the Isabela end, and 3½ kilometers of subgrade completed. The opening of this road will greatly facilitate the transportation of laborers from Cebu and Bohol to the numerous sugar centrals in the Province of Occidental Negros. It will also be an important highway for passenger traffic between Cebu and Iloilo in connection with launches plying between Toledo, Cebu, and Guijulngan, Oriental Negros, and between Pulupandan, Occidental Negros and Iloilo, Iloilo Province.

The Naga–Pasacao Road, Ambos Camarines, 26.2 kilometers in length; Insular allotment, ₱92,500. It is one of the most important road projects being undertaken by the Philippine Government at the present time, in view of the extension of the Manila Railroad line from Calauag to Guinayangan port, from where it will connect by steamer with Pasacao. At the same time, the railroad system in Albay and Ambos Camarines is being extended to Naga. Therefore, it is evident that the Naga–Pasacao Road will be the connecting medium between these two railroad systems. Besides giving the Bicol Provinces excellent connection with Manila, the completion of this road will open up a vast tract of fine agricultural lands now lying idle along the whole length of the road.

The Albay–Sorsogon Interprovincial Road, 52.5 kilometers in length; Insular allotment, ₱179,568.50. All the subgrade and 7 kilometers of surfacing on the Albay side, and a stretch of 22 kilo-



First course. Km. 9. Placer–Mainit Road. Surigao Province.

Many tons of rock were blasted to improve this part of Himangpangon trail, Oriental Negros Province.

meters of subgrade and 15 kilometers of surfacing on the Sorsogon side, have been completed. There remain yet to be opened 16 kilometers on the Sorsogon side. An early completion of this road would be of utmost importance, not only from the standpoint of agricultural pursuits (the development of extensive hemp and coconut lands), but also from the standpoint of passenger traffic between Manila and Sorsogon, because it would then be possible for travelers going to or from Sorsogon to connect by means of automobiles with the railroad system and the Naga–Pasacao Road mentioned above, thus avoiding the much dreaded trip by steamer through the San Bernardino Strait.

The Lucban–Sampaloc–Mauban Road, Tayabas Province, 28.5 kilometers in length; Insular allotment, ₱75,000. The location survey of this road was finished early in the year, and 11 kilometers of subgrade from Lucban and 4 kilometers from Sampaloc towards Lucban have been completed. First course stones have also been placed over 9 kilometers of subgrade from Lucban. The opening of this road will be a great help to the transportation of excellent class of hemp and coprax produced by the towns of Sampaloc and Mauban, which produce is at present transported on pack animals over a very steep rocky trail, known as the "Bitucang Manoc" trail, to the Railroad Station at Lucena, the capital of the province.

The Pagsanjan–Luisiana Road, Laguna Province, 18 kilometers in length; Insular allotment, ₱50,000. The work reported in 1918 consisted only of opening a horse and construction trail. During 1919, 60% of this trail has been widened to a 7-meter roadway involving the removal of 44,334 cubic meters of earth and rocks at unit costs of ₱0.69 per cubic meter of earth and ₱0.95 per cubic meter of rocks.

Part of improved Himangpangon trail, January 1, 1920, Oriental Negros Province.

Dumaguete wharf, Oriental Negros.

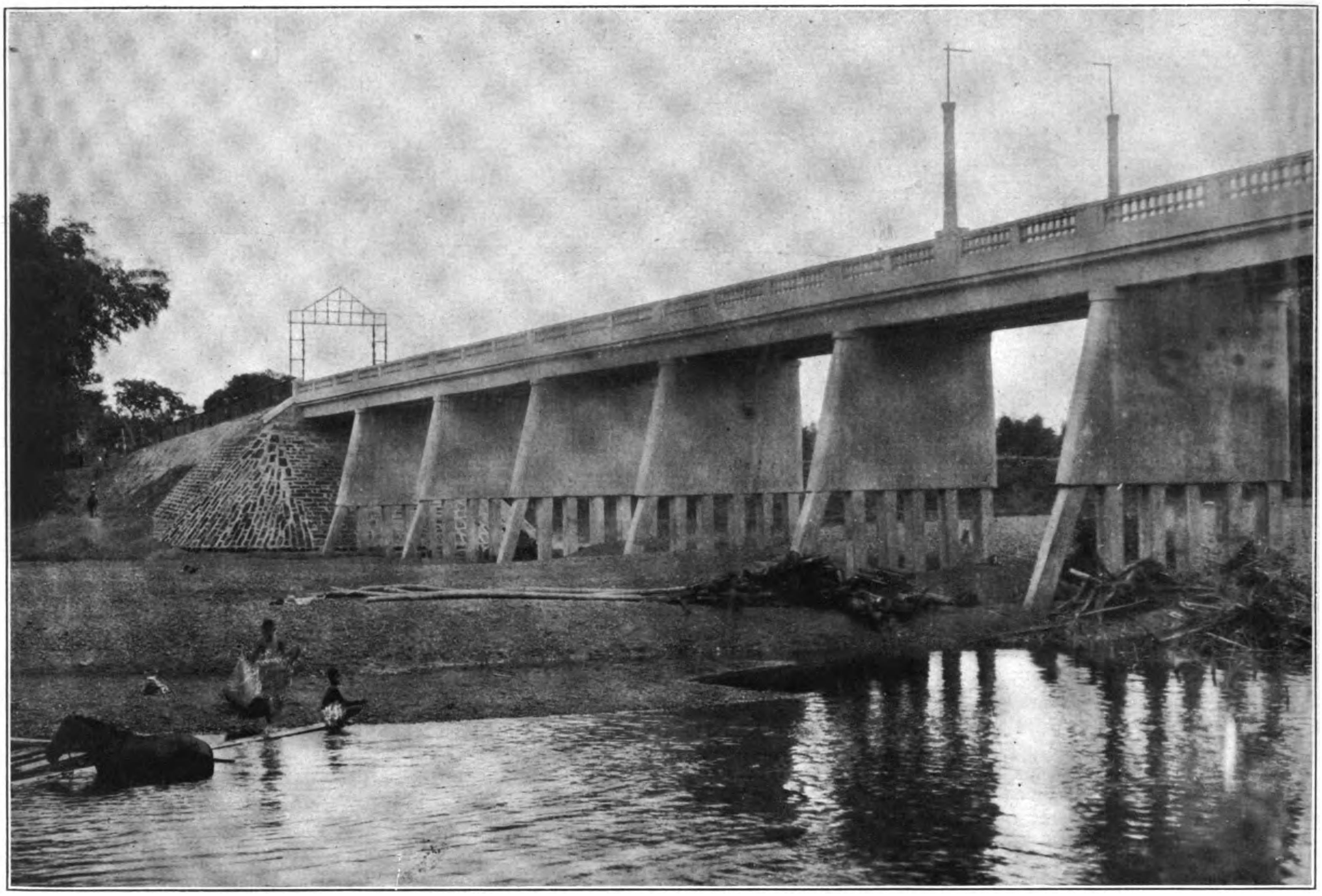
The Bolbok–Candelaria Interprovincial Road, Batangas Province, 14.68 kilometers in length; Insular allotment, ₱40,000. Sixty per cent of the metalling of this road has been completed. There remain to be done 4 kilometers of surfacing and the bridging of the Malaquing Ilog River, all of which are expected to be completed during the year 1920. This road, in connection with the Rosario–Bolbok project, will provide an accommodation for the large traffic between Batangas and Tayabas and will give the eastern part of Batangas connection with the railroad at Candelaria.

The Manila–Tarlac Road between Magalang, Pampanga, and Concepcion, Tarlac, 13.5 kilometers in length; Insular allotment, ₱25,000. The Pampanga side of this road has been finished as far as the boundary, as well as all the subgrade, 4½ kilometers of surfacing and 6 wooden bridges on the Tarlac side.

The Pampanga–Bataan Interprovincial Road, 16.18 kilometers in length; Insular allotment, ₱85,000. The grading of this road has been completed throughout and opened to automobile traffic during the dry season, making it possible for the people of Bataan to come overland to Manila. There remain to be done only the surfacing of 6 kilometers of subgrade and the construction of an 80-foot Howe Truss wooden bridge over the Layac River. A big portion of this road suffered considerable damage from the typhoons of July and August, when the water flooded the road in many places.

The Bangui–Claveria Trail, Ilocos Norte, 60 kilometers in length; Insular allotment, ₱100,000. Ten and a half kilometers of standard first-class subgrade construction has been completed on the Cagayan side, which leaves 5 kilometers to connect with Ilocos Norte boundary. On the Ilocos Norte side an excellent horse-trail has been constructed along the precipitous north coast of Luzon from Pasaleng, about half-way between Bangui and the boundary, to Landangan, the first township in the Subprovince of Apayao. Work is now in progress from Pasaleng towards Bangui, and is about to connect with the old Spanish trail on the lowland section between Bangui and Pasaleng.

The Nueva Ecija–Nueva Vizcaya Interprovincial Road, 60 kilometers in length; Insular allotment, ₱190,000. The survey of this road was started in December, 1916, and actual construction begun in April, 1917. The progress of the work on this project was greatly handicapped in 1918 due to the trancazo and smallpox epidemics, which broke out among the 1,500 laborers imported from the Subprovince of Ifugao. In order that the work might be accomplished in a more economical and scientific way, a new organization was built up in May, 1919. A resident engineer, experienced in road location and construction, with one assistant engineer and several instrument-men was detailed specially on the project, and the entire work taken from the hands of the district engineer of Nueva Ecija, who could not possibly, under the circumstances, handle the various projects in his district and this big road project at the same time.



Buendia Bridge, formerly Santa Maria Bridge, Bulacan Province, an eleven 10-meter span R. C. Deck Girder Bridge on concrete pile bents. Note fill around abutments made of large adobe stones cemented together. The fill has 1:1 slope to protect the abutments from scouring.

The actual construction work was resumed in September, 1919, with the new organization which averaged 1,500 laborers daily, while the average expenditure amounted to ₱40,000 a month at one time. At the close of the year 1919, the final location survey of the entire road was finished, a stretch of 7 kilometers built first class, and 10 kilometers of 6-meter subgrade and 21 kilometers of 1½ to 3 meters trail opened to bull-cart traffic and travellers on horseback. Provided sufficient funds would be available in the coming year, it is believed that the entire road from San José, Km. 160, to Puncan, Km. 177, a distance of 17 kilometers, will be ready for bull cart and light automobile traffic, and that the section from Puncan to Santa Fe, Km. 220, will be passable for horses and pack animals before the rainy season sets in. With the opening of this road and the Bangui–Claveria Road mentioned above, the fertile Cagayan Valley, famous for its production of tobacco, will be opened to Tagalo, Pangasinan, and Pampango homeseekers from the south, and Ilocano settlers from the north.

Camp One–Aringay Road, La Union Province, 34 kilometers in length; Insular allotment, ₱70,000. The subgrade of the entire road and 16 kilometers of surfacing from Camp One to Damortis, where a new railroad station has been established since the opening of this road, have been completed. Also all reinforced concrete culverts up to 5 meters span have been constructed from Camp One as far as the town of Agoo. This road is the last connecting link of the Manila–North Road.

The Bataan–Zambales Interprovincial Road, 46.5 kilometers in length; Insular allotment, ₱55,000. The location of this project for a first-class construction has been completed, and grading started from both ends (at Dinalupihan, Bataan, and Subic, Zambales). Seven and one-half kilometers of subgrade has been completed at the Bataan end. The opening of this road will relieve the Province of Zambales from its almost complete isolation from the rest of the Islands during the rainy season, and will permit the development of the rich agricultural lands of the entire province.

Great progress has also been accomplished in the construction of first and second-class roads in the Cagayan Valley connecting the Provinces of Cagayan, Isabela, and Nueva Vizcaya, and it is expected that automobile traffic between them would be inaugurated in the early part of the ensuing year.

Also extensive trail constructions were undertaken throughout the year in the Mountain Province and in the Department of Mindanao and Sulu.

Besides the foregoing roads constructed with Insular funds, a large amount of road work was also done with purely provincial funds in the Provinces of Zambales, Oriental Negros, Pampanga, Bohol, and Tayabas.

BRIDGES.

In spite of the high cost of materials, both of local and foreign production, it has been possible to construct during the year the following important structures:

Buendia Bridge in the Province of Bulacan, a reinforced concrete pile-bent type, 110 meters total length, costing ₱87,716.41. This bridge connects the town of Santa Maria with the Manila–North Road.

The two abutments of the Bunsuran Bridge on the Bigaa–Pandi–Angat Road, also in the Province of Bulacan. The 70-foot timber superstructure will be placed as soon as the materials are received.

The Calero Bridge (now called Soriano Bridge), Cavite Province, at a cost of ₱11,463.29. It is a three 7-meter spans reinforced

Bird's eye view of Catbalogan, Samar, showing general location of Catbalogan Causeway to the rest of the town.

concrete-pile bent type. With the exception of the Zapote Bridge, which will be constructed in 1920, and the Binakayan Ferry, all openings from the Rizal boundary to Cavite have been bridged up with the completion of the Calero Bridge.

The substructure and 50 per cent of the superstructure of the Parañaque Bridge, Rizal Province. The bridge is one of the eight 9-meter spans on reinforced concrete piles, with two sidewalks, and is being done by contract. The estimated cost is ₱65,000, and the contract price, ₱55,000. This bridge will replace the old wooden structure on timber piles encased in concrete on the Manila–South Road.

On the Manila–North Road, through the Province of Ilocos Sur, one 5-meter and one consisting of two 4-meter spans reinforced concrete rectangular culverts and four reinforced concrete bridges consisting of two 7-meter spans on reinforced concrete pile-bents, and the San Matias River Bridge on the Bangued–Peñarrubia Road, Abra Province, consisting of 9 spans of 5.7-meter timber overflow superstructure on timber piles and concrete piers.

The Marusay River Bridge, nine of 9-meter spans reinforced concrete pile trestles, on the Dagupan–Bayambang Road, and the Catablan River Bridge five of 9-meter spans of the same type, on the Urdaneta–Calasiao Road, both in Pangasinan Province. The first is being done by contract at a contract price of ₱36,887, and the second by administration with an appropriation of ₱37,741.04. At the close of the year they were, respectively, 32 and 18 per cent completed.

The Sabang River Bridge on the Barcelona–Bulusan Road, Sorsogon Province, a 54-foot timber Howe Truss, at a cost of ₱9,459.28.

The Inabanga River Bridge in Bohol Province, consisting of sixteen 6-meter spans collapsible timber trestle, at ₱10,582.41.

Another example of the so-called overflow type of bridge mentioned in last year's report is the Miagao structure constructed in the Province of Iloilo, which cost approximately ₱10,000 as compared to the cost of a bridge of the ordinary type, which would be not less than ₱75,000 if it were the type built over the Miagao River. Flood water reached a maximum depth of 2.5 meters over the spill way on two occasions, for periods of several hours, without doing any damage.

PORT WORKS.

Considerable studies and investigations of various port work developments have been made throughout the Islands and plans are now well under way for the construction of a number of them. Besides the 1918 projects which were carried over through the year 1919, many new projects were started also in 1919, as they will be noted below:

Manila.—With the advent of peace came an immense amount of held-over goods to our shores and the question of cargo space became acute. The construction of the pier sheds between Piers No. 3 and No. 5 was rushed to completion, and now there remain to be done only the pier heads proper, for which plans are being revised. Bituminous macadam was used for the flooring of these sheds on account of the high cost of wood block, and the liability to excessive settlement. All the pagatpat piles necessary for the replacement of the pile-fender systems for Piers No. 3 and No. 5 have been delivered at the site, which were obtained from Mindanao after considerable delay. Construction work will commence as soon as a pile-driver is available.

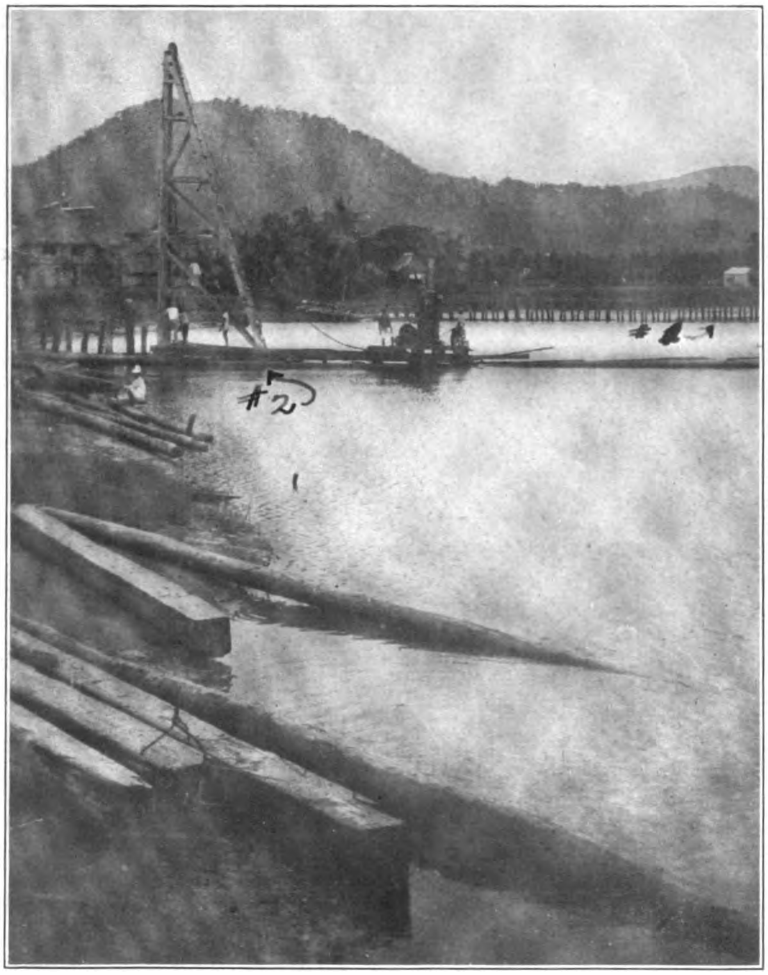
Surveys have been planned and inaugurated for all estero, river, and harbor lines, and when completed, they will form a basis for the improvement and control of Manila waterways.

With the construction of Pier No. 7 the consequent necessity for more launches presents itself. The only inspection launch available is in need of a new engine.

Lanao.—Wharf construction advanced in a very gratifying manner during the last quarter. At the beginning of the second quarter the finished wharf was 340 feet long; by the end of May it has been extended to 430 feet, and all piles driven except the fenders, which were completed by the end of June. The wharf was serviceable from the first of June. There is to be a storeroom 32 by 120 feet at the end of the wharf parallel to the center line of the wharf equipped with a double track dinky line of 24-inch gage. An approach fill to the wharf and bodega was made to eliminate all grade whatsoever between the storeroom and the wharf.

The construction of the Iligan revetment was started last September. The project as planned was to drive three lines of hurdles, each to consist of a double row of piles 1.20 meters on centers, the rows to be 1 meter apart. Each hurdle is to be about 50 meters in length. The piles will all be guijo and will have an average penetration of about 20 feet and will project about 5 feet above lowest water.

Davao.—The Davao wharf is nearing completion. This is of an "L" type wide enough to allow trucks to get in and receive cargoes direct from the boats. Two lines of tram rails laid through the whole extent of the wharf facilitate the hauling from the dock to the merchants' warehouses near the wharf.



The Iligan River revetment. It is planned to drive this year three of the five proposed hurdles, each 50 meters long. The pile driving machine is seen working on the second hurdle. Province of Lanao.

Zamboanga.—A 160-m. sea wall is being built by Mr. C. V. Powers, contractor for the Zamboanga dock at a cost of ₱437 per lineal meter of wall section and ₱552 per lineal meter of combination wall and step section. The wall as designed has a pile foundation and rock backfill and is provided with a reinforced concrete lip supporting a system of fender springs and fender piles. The footing of the wall is placed sufficiently low to allow for dredging along the front to sufficient depth for launches and smaller sailing vessels. The dredged materials will be deposited behind the wall, and the port area thus reclaimed will be utilized for a customhouse and warehouse sites.

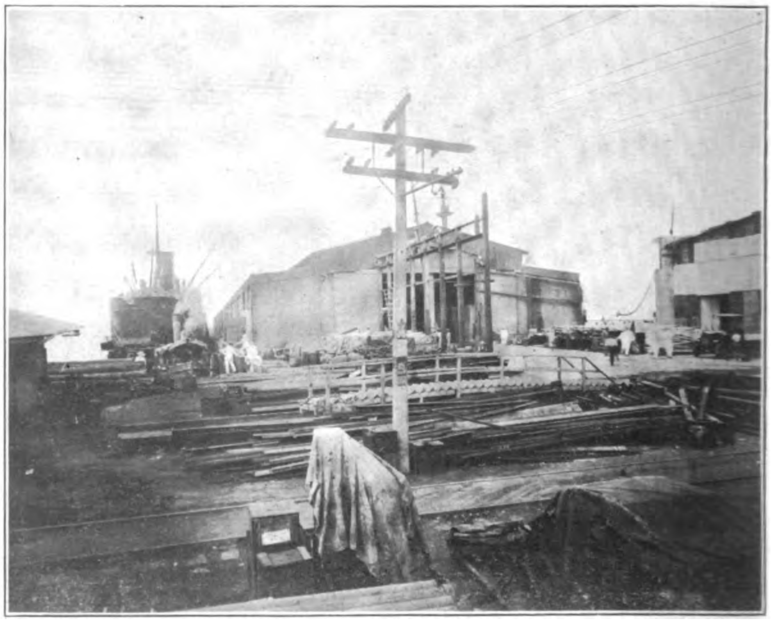
Sulu.—There were ordered 22 teak piles, 60 and 50 foot lengths for the construction of the Jolo Wharf. Surveys and soundings have been made to determine the base of the rubble wall.

Pier Head No. 3 and the proposed Pier Head No. 4 partially completed, shown near the extreme left. The building in the center is the cargo bodega, Manila, P. I.

The construction of wharves at Siasi and other points is going on very satisfactorily. A large force is working on the Cagayan de Sulu dock, driving piles. Mr. Strattan, the deputy governor, is helping the district engineer in looking after this work. The Bongao dock construction will soon be started.

Iloilo.—Wharf construction on the Iloilo River wall has proceeded as usual during the second quarter. The greatest obstacle to rapid progress has been the difficulty of preventing the old wall and the fill back of it from giving way, as the site of the new wall was excavated. The old wall is of lime mortar masonry and has shallow footings, as compared to the new work. Explosives have been used to a slight extent in breaking up large pieces of the old wall which have fallen in. It is expected that as the construction gets further away from the old wall, progress can be greatly accelerated.

The steamship *Dredge* of the Bureau dredging fleet arrived in Iloilo late in June and immediately began dredging the lower reach of the river channel, and after this was completed, work was continued on the middle reach and portion of the upper reach, before the *Dredger* sailed to Cebu. With the limited funds available, it was impossible to complete all the work required; but even the little that had been accomplished turned out to be of tremendous value to shipping, as is evidenced by the fact that a ship which formerly had to move out into the straits to complete loading was able to load in the lower reach on her last trip. A total of ₱66,556.18 was expended during the year in dredging this port.



Pier No. 5 with its wooden approach demolished preparatory to the construction of a modern reinforced concrete pier head, Manila, P. I.

The old Catbalogan pantalan showing heavy seas in July. Present stone causeway is completed about 50 meters beyond the end of the wooden structure here shown. Elevation of roadway stone causeway is about 20 centimeters above that of roadway shown in foreground in picture.

Capiz.—The hydrographic survey for the port of Libas has been finished, and plans have been submitted for design.

Cebu.—The reclamation of the area inside the new dock extension was begun in May, and by September only 24,767 cubic meters of filling materials were pumped into the area, at an exorbitantly high cost of ₱1.44 per cubic meter including repairs to equipment, due to the worn-out condition of dredge No. 3, the only one available at the time. This condition has partly been remedied by the arrival of the steamship *Dredger*, but it will soon be further remedied by the nearing completion of the reconstruction of dredge No. 4 (formerly J. G. White and Co. Dredge "America"). The reconstructed dredge is calculated to dredge to a depth of 45 feet, and to pump the dredged materials a distance of from three to four thousand feet.

Samar.—The Calbayog River wall is 92 per cent completed. Property owners near this wall have already begun to reclaim the low ground between their buildings and the wall. The line of vessels lying alongside the wall is a proof of its value to shipping.

An appropriation of ₱40,000 is available for the Catbalogan causeway but no work is as yet being undertaken, as until the northeast monsoon begins to blow in December, the sea fronting Catbalogan is too rough to permit economical or successful work on the causeway. The direction of the monsoon must always be taken into consideration in Samar when portworks are attempted. During the period from December to June the east and north coasts of Samar are impracticable for small craft and the same applies to the west coast from June to December.

Oriental Negros.—Construction of the Dumaguete causeway and temporary platforms was begun in June. The work will be finished about February, 1920.

Romblon.—Topographic survey of the Romblon Wharf site has been made and submitted for the design of the wharf.

Palawan.—Recommendations have been made by the district engineer of Palawan to the effect that ₱50,000 be appropriated for the reconstruction of the Puerto Princesa Dock and ₱25,000 additional for the completion of the Coron Dock. One third of the work on the latter project has been finished since 1918.

Sorsogon.—The construction of the Gubat sea wall is about 50 per cent complete.

Tayabas.—The sum of ₱15,000 has been set aside for the construction of the Boac Pier. Materials for the concrete structure have been requisitioned.

Cagayan.—The Linao-Abulug Canal has been impassable during the third quarter, due to accumulated débris and current deposits that have constantly settled in the river bed. A stretch of about 295 meters between Kms. 7 and 8 and another stretch of 633 meters between Kms. 5 and 9 were excavated, while Kms. 3 and 4 were cleared of tall grass that obstructed the passage. Even with this work accomplished, the canal is navigable to small crafts only at high tide. The dredging of the canal in front of the municipal docks in Aparri is going on very rapidly. As soon as this is finished, the dredging of the main canal that connects Aparri and Rio Grande will be undertaken. Materials for the Canayon hurdles, a part of the general development of the Aparri harbor, are ready and work will begin as soon as the construction of the pile driver scow is finished. Preliminary plans for the general development of that port have been prepared.

DREDGING.

Dredging operations have been carried on in Manila and different parts of the Islands with the available equipment. However, the Bureau could not answer all calls for land reclaiming and navigation improvement, because of shortage of equipment. It would seem that no better investment could be made by the Government than the purchase of additional dredgers with necessary scows to carry out the wonderful opportunities for land reclaiming offered in the Islands. The equipment now on hand is inadequate, mostly old and of antiquated type. Much of the time is wasted in break-downs and waiting for repairs to be finished. The following tabulation shows the places where dredging work was done and the quantities of materials dredged:

Dredging operations, 1919.

Location.	Total from 1902-1918.	Fiscal year 1919.	Total.
	Cubic meter.	*Cnbic meter.*	*Cubic meter.*
Lower Pasig River	6,008,596	386,804	6,395,400
Outer Harbor	2,459,348		2,459,348
Upper Pasig River	675,045	19,206	694,251
Inner Basin	408,953		408,953
Binondo Estero	52,816		52,816
Estero da la Reyna	232,922		232,922
Paco Estero	26,965.40	1,107	28,072.40
San Miguel Estero	56,796	769	57,565
Provisor Estero	27,744		27,744
Marine R R. Engineer Island	30,865	2,444	33,309
Talim Island (City)	1,071		1,071
Outer Bar	760,931	277,220	1,038,151
San Sebastian Estero	3,556	4,193	7,749
Magdalena Estero	16,580		16,580
Engineer's Island Canal	30,180		30,180
Vitas Estero	296,150	29,516	325,666
Quiapo Estero	12,507		12,507
Cegado Estero	35,509		35,509
Pandacan Estero	172		172
Estero de San Lazaro	22,975		22,975
Corregidor Bay Q. M	54,956		54,956
Iloilo River	1,594,399.50	313,250	1,907,649.50
Cebu Harbor	212,684	36,967.50	249,651.50
Mariquina River	7,290		7,290
Balete Estero	21,646		21,646
District of Cavite	20,876.25		20,876.25
Tondo Beach	9,018		9,013
Santibañez Estero	19,762		19,762
Tanque Estero	10,500	12,780	23,280
Tacloban Wharf	34,105.50	400	34,505.50
Zamboanga	29,880		29,880
Cotabato River	11,350	38,112	49,462
Earnshaw's Slipways		2,208	2,208
Total	13,186,143.65	1,124,976.50	14,311,120.15

LIGHTHOUSE CONSTRUCTION AND REPAIR.

A coast guard cutter was furnished from time to time for the regular lighthouse construction, maintenance, and repair.

Catbalogan Causeway, showing heavy seas during present Southwest monsoon. Construction work impossible.

The following tabulation shows the location, details and cost of work done during the year:

Location.	Class of work.	Cost.
Balamban, Cebu	Construction of 28 feet standard concrete beacon.	₱273.80
Tuburan, Cebu	Construction of 16 feet and 24 feet ranges	1,000.00
Asturias, Cebu	Construction of two coucrete beacons	622.62
Comiran	Construction steel tower	8,739.65
Culion	Construction of beacons	4,704.79
Nasipit	Construction concrete beacon	4,983.83
Dumanhug	Construction of concrete beacon	3,161.00
Romblon	Reconstruction of 16 feet concrete beacons	1,464.25
San Fernando	Repairs	28.09
Corregidor	do	88.43
Tanguingue	do	1,308.54
Cabra	do	73.51
Pasig River	do	149.11
Cobrador, Romblon	do	214.51
Capitancillo	do	1,727.51
Malapascua	do	133.65
Gigantes	do	1,604.45
Puerto Princesa	do	283.84
Balinguian	do	634.78
Comiran	do	66.25
San Miguel	do	446.62
Bagatao	do	403.49
Bulan	do	283.44
Capones	do	6.10
San Carlos	do	0.27
Calabazas	do	1,778.72
Manigonigo	do	3,080.05
Saban Point	do	189.88
Davao Dock	do	850.20
Total		₱38,301.95

TELEPHONE SYSTEMS.

In Agusan, Mindanao, considerable amount of work has been done in the construction of telephone lines. Two ten-drop switchboards and wiring connections to the various residences and commercial houses in Butuan were installed. The Butuan–Libertad line is now in operation and all the posts for the Libertad–Buenavista line have been set out. Of the long distance telephone line, 22 kilometers have been installed.

In the remote Province of Davao an excellent system of telephones has been constructed, connecting the large plantations around the Gulf with the Wireless Station at Cuabo. The great interest of the planters in the establishment of this system was shown by their willingness to maintain the lines leading to their respective plantations, charging the Government only for the actual cost of the work. The temporary posts between Davao and Santa Ana have been replaced with concrete ones.

The construction of a telephone branch line from Guimbal to Igbaras has placed every municipality of the province of Iloilo in communication with the capital.

Materials for the construction of telephones lines for the Province of Zambales have been ordered. The installation was started in June. By the end of December 56 kilometers of lines have been established between Iba and Palauig, and a telephone central of 20 talking units, and 8 telephone apparatus, installed, connecting Palauig, Iba, Botolan, and Villar.

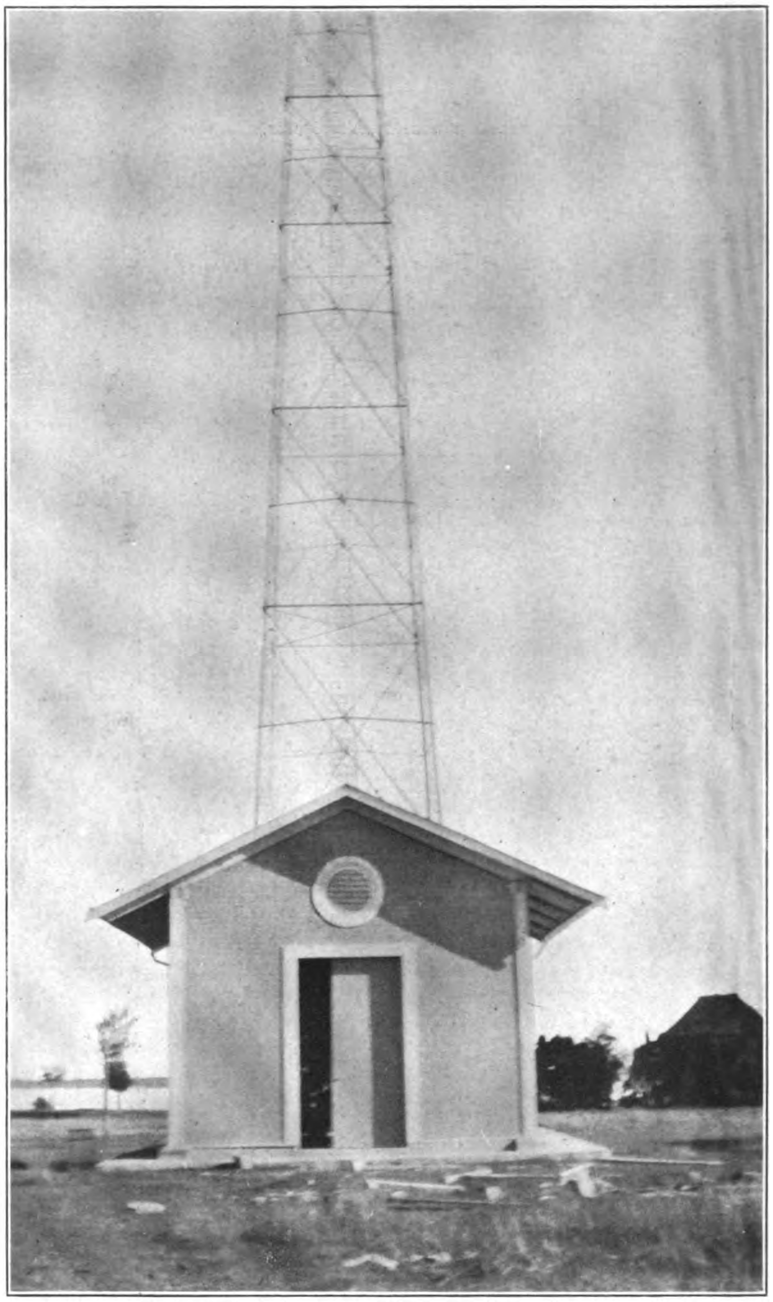
The construction of a telephone system for Ilocos Sur was started last December. The line from Vigan to Sinait has been completed.

It is proposed to construct in 1920 a telephone system to connect Puerto Princesa, the capital of the Province of Palawan, with the towns in the northern part of Palawan Island. The estimated total length of wiring is 119 miles.

WIRELESS STATIONS.

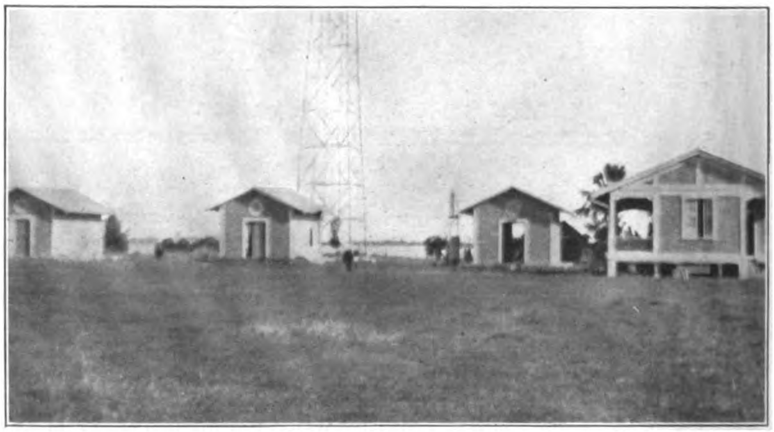
The erection of the wireless transmission tower, a 200-foot type A, galvanized steel, at Iloilo, Province of Iloilo, was completed by Mr. J. W. Ford, contractor, during the latter half of the last quarter. The power and store houses for the Radio Station were done by administration.

In Cebu, the foundation tests for the Mabolo Wireless transmission tower, another 200-foot type A, galvanized steel, have been made, and erection work will follow immediately. The contract was awarded also to Mr. J. W. Ford, Iloilo, for ₱5,246. The erection is expected to be finished in eighty days from the date construction is started.

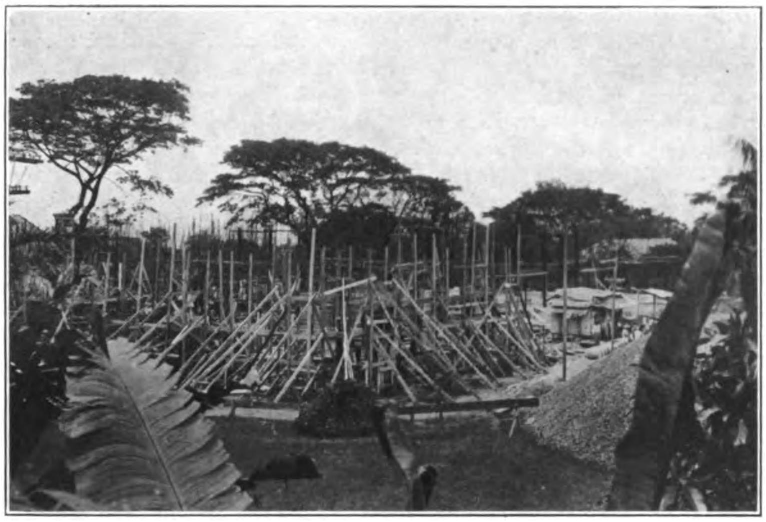


Operating House Radio Station, Mandawe, Cebu.

There will be constructed by contract three wireless transmission towers in the Province of Palawan during the first half of 1920. They will be erected in Culion, Culion Island, Balabac, Balabac Islands, and Puerto Princesa, Palawan Island, by the Cranston Engineering Company, Manila, for ₱9,681, ₱8,580, and ₱8,580 respectively. As stipulated in the contract, the amount of ₱1,300



Radio Station, Mandawe, Cebu.



Executive Building in process of construction as seen from a window of the Governor-General's residence (the old Malacañang Palace), Manila, P. I.

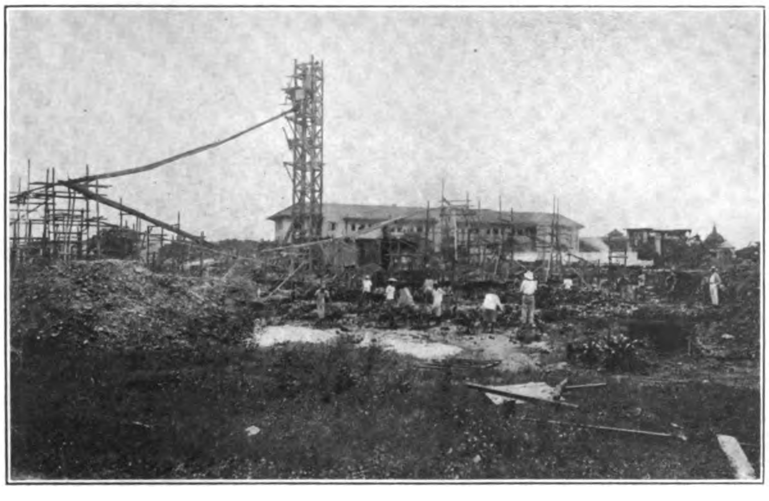
will be deducted from the lump sum of ₱26,841, making ₱25,541 as the net contract price, if the three above-mentioned projects are awarded to this company. The steel towers will be of type B 150-foot galvanized steel, with concrete base measuring 15 feet and 6⅛ inches by 15 feet and 6⅛ inches on the outside. All the three of them will be erected within one hundred and twenty days.

Two other projects were awarded to the same contracting firm, the erection of the Bongao wireless transmission tower, Tawi-Tawi Island, Sulu, and the Cagayan de Sulu wireless transmission tower, Mindanao and Sulu. Both towers are to be of 150-foot type B, galvanized steel tower with concrete base. The contract price is ₱9,870 each. The contract papers are still in the hands of the Honorable, the Secretary of Commerce and Communications.

During the last quarter a temporary wireless station was constructed in Bongao, Sulu, for which ₱15,688.07 was available for expenditure.

The two highest wireless galvanized steel towers in the Philippines have been constructed in Batangas, Batangas Province. They are each 300 feet high, type D, with concrete base measuring 32 by 32 feet on the outside. The contract was given to the Atlantic Gulf and Pacific Company for ₱7,650. There was appropriated for expenditure on this project the sum of ₱26,000 to include the construction of one operating-house, one power-house, one store-house and two operator's quarters, all of which were about finished by the end of the year.

Since May, 1917, the proposed radio station for Santo Domingo de Basco, Batanes Islands, has been conceived, for which ₱50,000 was released in the same year for the purchase of the necessary wireless equipment and for construction expenses. In view of the lack of regular means of transportation between Manila and those Islands, however, no satisfactory bids have so far been received for the erection of the 200-foot transmission tower, and the entire work may have to be done by administration.



Foundation work on the Library and Museum building which when completed will be used temporarily as the Insular Capitol. On the background may be seen from left to right: Normal School, the Girls' Dormitory, and the dome of the Church of San Vicente de Paul.

The Radio Station at Cuabo, Davao, was threatened by the rising sea during the month of October, and consequently it was thought advisable by the Director of Posts to close the old station and transfer the equipment to Malita, Davao, where a suitable location has been obtained. The total estimate for the construction of the Malita Radio Station is ₱9,960. There will be erected two 100-foot transmission towers.

The erection of the proposed wireless station at San Jose, Mindoro, was advertised, but no satisfactory bids were received. However, on the strength of the Mindoro Sugar Company's offer to help in the construction, supplying all labor and furnishing all the necessary materials at cost price, except the tower steel, the entire work will be done by administration. The tower will be a 150-foot type B with a 15 feet 6⅛ inches by 15 feet 6⅛ inches concrete base.

The construction of the four temporary buildings for Mandawe Radio Station, Cebu, was undertaken in November. The estimated costs, including surcharges and transportation of the materials, amounted to ₱16,700. At about the same date the construction of the four temporary buildings for the Isla de Camote Radio Station, Cebu was also started. The transmission pole will be a 60-foot Yacal timber equipped at the top with the necessary wireless equipments. The work will be done by administration.

Front View, Santa Cruz Intermediate School, Bureau of Education Plan No. 20, under construction, Laguna Province.

BUILDINGS.

Building construction in Manila was handicapped at first due to the inadequate equipment available at the beginning of the year. In order to remedy this situation, two complete concrete mixers with hoisting towers and chutes and one contractor's saw-rig were ordered from the United States; a planer, one motor for power and a hoisting engine were purchased locally; an old circular saw was repaired; an old concrete mixer was rented from the City of Manila, and an electrically operated concreting hoist was improvised. With this new set of equipment, considerable saving in time, money and labor was accomplished.

On account of the inadequate equipment mentioned above, contracts were resorted to in many cases. In this connection, it is believed that it would be a great advantage to the Government to be in a position to do any work by administration for which rock-bottom bids are not received; otherwise contractors would take advantage of their position.

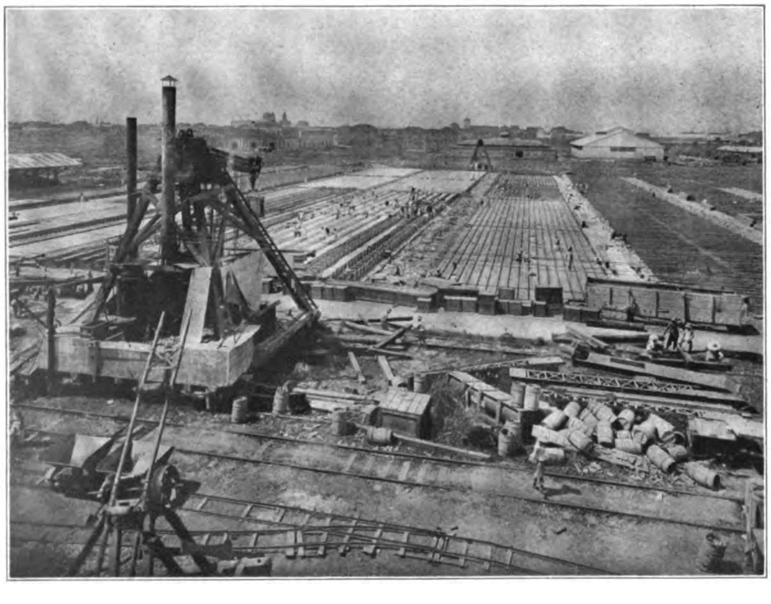
Soon after the Executive Building piling contract was completed, the erection of the building was immediately taken up by administration, and it is now well underway towards completion. This building is one of the finest and most elaborate yet undertaken in Manila.

The Insular Capitol piling contract, which had been halted due to contemplated change in the building location, was resumed after some delay and satisfactorily completed by the Atlantic Gulf and Pacific

Construction plant and site, Pier No. 7, Manila, P. I.

Company. The foundation footings were let to Tan Samco, the Government furnishing the steel. The Nurses' Dormitory foundation piling and footings contract was given to the same contractor, the Government furnishing also the steel and cement. In this work great difficulty was experienced in obtaining suitable piles.

The construction of the Rizal Hall Building, a three-story structure, was started early in the second quarter by administration. The work on this building progressed very rapidly, and as a result of efficient workmanship and supervision, 50 per cent of the first story has been completed. This building will later be connected to the present University Hall making of the two buildings one imposing edifice.



General view of pile casting plant, Pier No. 7, Manila, P. I.

(Piles are 2 feet square by 110 feet long.)

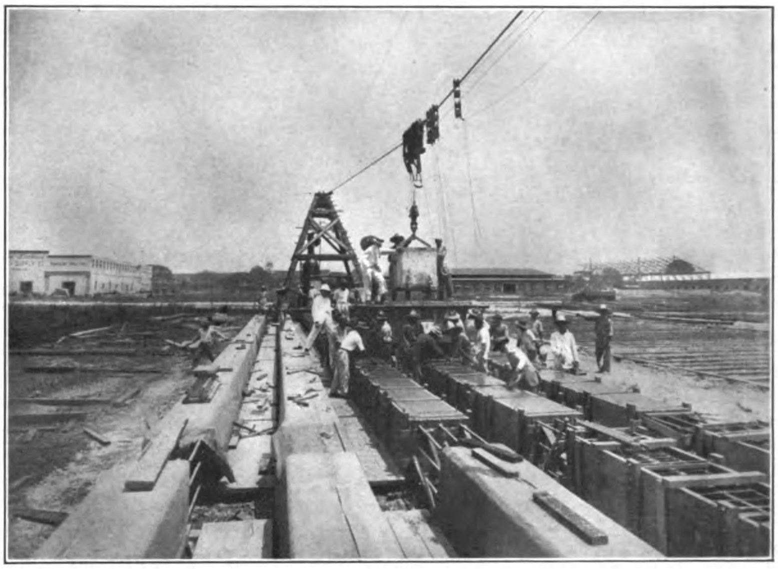
The Maternity Ward and Dining Pavilion additions to the Philippine General Hospital were only partially let by contract, due to the astonishing rise in the cost of labor and materials. Funds have been assured for their completion during 1920.

The San Lazaro Hospital buildings have been completed with the exception of the ornamental work, which is being done by contract.

The Trade School, begun in the latter part of 1918, has been completed and occupied by the school. Numerous campus improvements were carried out in connection with the construction of this building.

The new addition to the Bureau of Printing has been advertised, and as no satisfactory proposal was received, the work will be done by administration.

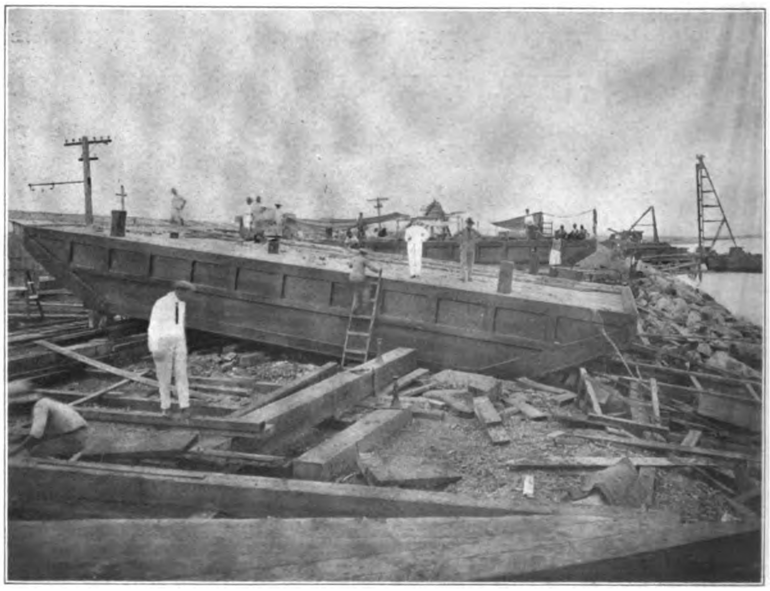
The construction of the Leyte Capitol Building was continued during the year with a loan of ₱150,000. At the close of the year 74 per cent of the structure was completed, representing an expenditure of ₱441,206.77. It is a two story reinforced concrete building 22 meters wide by 43 meters long, with special precast reinforced concrete trim for both the interior and exterior and special surface treatment of very white limestone, involving the use



Close view of pile plant in operation, casting piles, Pier No. 7, Manila, P. I.

of double forms in the placing of concrete. First group lumber for the wood work will be used throughout the building. The ornamental features in general are similar to those of the Pangasinan Capitol Building except that the former are more elaborate and comprise the latest development of artistic treatment of reinforced concrete buildings in the Islands.

Construction work on the Zamboanga Normal School was continued with an appropriation of ₱65,978.69. At the close of the year the building was 88 per cent complete. It is a two-story reinforced concrete structure with a wing on each side and a terrace in front. It is the first large normal school building ever constructed in the Philippine Islands, outside of the city of Manila, it being 37.10 meters wide by 53.80 meters long.



150-ton material scow ready for launching, Pier No. 7, Manila, P. I.

At Iloilo a normal school building was under construction at the end of the year, with an appropriation of ₱175,089.97, which is a little over one-half of its estimated cost. The building is of reinforced concrete structure, and has a plan similar to the letter "H," two stories high, 21.775 meters wide by 83.80 meters long. As the funds available are limited, only one wing of the building is being erected at present.

A similar normal school building has also been proposed for Cebu with an appropriation of ₱240,000. The foundation tests have been made and construction work will follow immediately.

Another normal school building of the same type as the Iloilo and Cebu buildings was under construction at Laoag during the last quarter, with an appropiation of ₱203,090.93. The building was 28 per cent complete at the close of the year.

The construction of the Zamboanga General Hospital (a) was also continued with an appropriation of ₱22,385.01, and at the end of the year the building was 90 per cent complete, representing a total expenditure of ₱106,228.86. It is a twin reinforced concrete building, with tile roof, one story high, 14.48 meters wide by 26.66 meters long.

A Bureau of Education standard plan No. 20 school building was also under construction during the year in the town of Santa Cruz, Laguna Province, with an appropriation of ₱72,498.17, and was 55 per cent complete on December 31.

The construction of the Bohol Provincial High School Building was continued with an appropriation of ₱28,569.56, and was completed with a total expenditure of 86,646.82. The building is of the Pasig Provincial High School type, one story high.

An appropriation of ₱100,000 was made available for the construction of a high school building at Capiz, Capiz Province. The provincial officials have not as yet decided as to the type of building they will have.

The usual school and market building work was carried out in spite of the necessity for meeting the greatly increased cost of materials; and at the close of 1919, 30 new market and school buildings were added to those in existence in previous years.

(*a*) *See frontispiece.*

DESIGNING DIVISION.

E. C. EARLE, *Chief Designing Engineer.*

The practice of preparing plans for structures, with a view to their temporary construction, was in many instances again resorted to due to the continued high price of materials. Adobe stone and

View of locomotive crane erecting the largest steel pile driver ever built in the world to be utilized in driving huge concrete piles, Pier No. 7, Manila, P. I.

timber comprised the materials of a temporary nature which were used for this class of work.

Irrespective of the fact that the division has been enormously handicapped as regards designing engineers, a considerable amount of work has been accomplished. The design and construction of Pier No. 7 was given first attention, every effort being concentrated upon that project. Numerous investigations have been instituted, studies made, estimates, specifications and plans prepared for various projects, such as bridges, tanks, lighthouses, buildings, pumping and power plants, light plants, wireless stations and other miscellaneous structures.

Plans were prepared during the year for a large number of projects, including scows and other floating equipment, such as dredges, pile drivers, etc. Plans were also made for two 300-foot steel wireless transmission towers, which were erected at Batangas, Batangas; for three 200-foot steel wireless transmission towers, one of which was erected at Iloilo, Iloilo, another at Cebu, Cebu, and a third to be erected at Basco, Batanes. Plans for six other steel wireless transmission towers were prepared; the towers to be erected at various points throughout the Islands. Plans were also made for a fire-proof vault, to be constructed for the Bureau of Internal Revenue; for mooring posts to be utilized by vessels mooring along the Pasig River; for various pile driver parts and dredge machinery; for the sea-wall at Zamboanga, Zamboanga; for a reinforced concrete girder bridge No. 247.9, on the Dagupan–Kayambang Road over the Marusay River, Pangasinan; for a reinforced concrete girder bridge No. 213.0, on the Urdaneta–Calasiao Road over the Catablan River, Pangasinan; for the installation of an air-lift pumping system at Cebu, Cebu; for the Osmeña Waterworks; for a timber bridge No. 36.481, on the Bigaa–Pandi–Angat Road over Bunsuran River, Bulacan; for four reinforced concrete light beacons at the Port of Loay, Bohol; for various fences of concrete, etc.; for the preparation of miscellaneous timber bridges; for numerous repair jobs throughout the Islands; for a fender-pile system on the Zamboanga Wharf, Zamboanga, Zamboanga; for the Boac Pier, Subprovince of Marinduque, Tayabas; for the complete reconstruction of the Los Baños stone crushing plant, including a very large storage bin; for a steel turntable at Los Baños; for various trailers, to be used throughout the Islands; for coal bunkers for the Insular Government Ice Plant; for a timber bridge on the Barcelona–Bulusan Road, over the Sabang River, Sorsogon, Sorsogon; for a 5,000-gallon Imhoff tank; for a 200,000-gallon Imhoff tank; for the Bontoc Electric Light Plant, Bontoc, Moutain Province; for a pumping and electric lighting station at Pagsanjan, Laguna; for Pier No. 7, including the design of the entire construction plant, which consisted of plans for a provisional wharf, plans for head and tail towers, including entire engine and cable rigging; plans for numerous scows, mechanical loading devices, stiff leg derricks, pile drivers, reinforcing fabrication plant, marine slipway, and other numerous details of more or less importance.

Standing foremost among the projects above enumerated, is the development for Pier No. 7 at Manila, and its construction plant. As previously stated, this division concentrated its small technical force, to a great extent, upon this project and projects closely related to its development. Plans and specifications covering the necessary machinery and construction equipment were prepared, and Capt. W. J. Grodske, an engineer of this division, was maintained in the United States to supervise the purchase and fabrication of that portion of the plant which it was deemed advisable to import.

The pier, as designed, will be built entirely of reinforced concrete, with the exception of the steel roof trusses and galvanized iron roof. The nature of the underlying material of Manila harbor necessitated an extended investigation on the part of this division, prior to the execution of a design. After having driven a large number of test piles and after having put down several hundred test holes with a Calyx core drill, and having obtained numerous data and samples of materials in their natural state from the harbor bottom, it was decided, economy and speed of construction considered, to erect the superstructure of the pier upon a substructure composed of reinforced concrete piles.

Inasmuch as the profile of the underlying hard material of the harbor bottom varies considerably, designs have been prepared for variable lengths of piles, the shorter piles being approximately 85 feet in length, and the longer piles 110 feet long. In this connection, attention is invited to the fact that the last mentioned length of pile exceeds, by 5 feet, the length of any concrete pile ever recorded as having been driven in the annals of subaqueous construction. Special provision was made for casting and handling these large units (24" x 24" x 110') efficiently. A large locomotive crane has been built to pick up the piles and to carry the piles from the pile field to the pile barges, the latter tending the pile driver. The locomotive crane is provided with a 40-foot and 65-foot boom, from which will be suspended a long box girder directly over the axis of the pile to be lifted. Special provision has been made in the design of this girder support, to enable the pile to be lifted at four points without the introduction into the pile of heavy and eccentric forces.

To insure the greatest length of life to the structure, the piles were cast of an especially ground cement, low in alumina content, the cement being obtained, under contract, after considerable negotiation from Japan. The piles have been cast from a rich and dense mix, the coarse aggregate of the mixture being the very best quality of stone obtainable in Manila, the latter being obtained from the Government quarry at Los Baños. For the purpose of obtaining a high quality of stone for this work, it was necessary to redesign and enlarge the Bureau's quarry at Los Baños and to design and construct a fleet of scows to furnish and provide adequate equipment for the handling of the aggregate at the site of the pier. One-half of the fleet of ten scows are now in operation and the remaining half will be launched very soon. The crushing and screening plant at Los Baños is working to capacity and furnishing an adequate supply of best material for this work. For the purpose of handling the raw materials, such as stone, steel, cement, etc., and machinery parts, designs were prepared for a provisional wharf, a large stiff leg derrick, stone and sand storage bin, etc., adjacent to the pier proper. These structures and devices are now all operating to capacity. A large pile driver for handing the piles previously mentioned, required a special design and was fabricated and built in the United States under the supervision of Capt. W. J. Grodske. All of the machinery for this pile driver is now in Manila and in process of erection. The possession of this fine piece of equipment by the Bureau will enable the Government to construct throughout the Islands piers and wharves of a permanent nature, which has heretofore been an impossibility, owing to the fact that no suitable equipment has been available in the Philippines.

To expedite the casting of the large number of piles required for this project, a special design was prepared for the erection of a movable cableway which enables the concrete to be mixed at a central plant and transported over the entire pile erea, the cable being suspended directly above the piles. The novel feature of this plant is apparent when it is understood that the plant is mobile and leaves the pile field clear of all obstructions. Photographs covering the various phases of construction work to-date are appended hereto with appropriate descriptions below each as well as photographs or plans of the structure.

This structure, upon completion, will place the Port of Manila on an equal footing with any other ports of the world, insofar as up-to-date marine terminal structures having all modern facilities are concerned. Every provision has been made, in connection therewith for the rapid and efficient handling of freight.

Salient features of the design are the provisions made to handle the cargo from ship's hold to the wide pier apron, to the waiting freigth cars, or to the platforms of industrial trucks, with large gantry crane of the semi-portal type, the latter being operated in conjunction with flexible system of overhead interior rapid-hoisting cranes, capable of movement both laterally and longitudinally, and electric industrial elevating trucks and tractors. It is anticipated that, after the cargo handling equipment has been put into commission, ships will be able to clear from Manila in approximately one-third to one-half of the time usually required.

Ample provisions have also been made for the comfort and convenience of the Trans-Pacific passenger traffic. Arrangements have been made for ample waiting-room space and other conveniences, for the use of the passengers. Space for the use of Customs officials, including such offices as are necessary, and a large and convenient baggage-room, have also been provided for.

In the development of this project, the usual and dangerous method of handling passengers and cargo over the same area, has been departed from. A novel feature has been provided, in the form of an overhead passenger passageway, to enable passengers to reach the ship's deck or waiting rooms without the necessity of passing thru the more or less dangerous areas utilized for the loading, unloading and storage of freight. The ship's deck will be reached by ascending the stairs on either side of the lobby just forward of the baggage and waiting rooms, and then passing thru the overhead passageway to a movable bridge which will connect the passageway with the ship's deck.

For the purpose of fully developing the South Port District and providing Manila with a marine terminal, adequate to efficiently cope with the ever increasing commerce at this port, a complete study of the existing situation and the problems involved, was made by this division, and a program for the improvement of same, involving an expenditure of approximately ₱40,000,000, submitted.

The recently built Nurses' Home, shown on the left background, and the new Nurses' Dormitory under construction, Philippine General Hospital, Manila, P. I. Pile Driver seen at work in the center.

This program includes the construction of a new pier, to be known as Pier No. 9, in addition to Pier No. 7, which is now under construction, the extension and reconstruction of Piers Nos. 3 and 5 (Pier No. 9 and Piers Nos. 3 and 5 to be built the same as Pier No. 7), the construction of marginal wharves and cargo sheds between Piers Nos. 1 and 3, 5 and 7, and 7 and 9. The construction of a loading and discharging head for fuel oil and other oil tank ships calling at this port, the purchase of proper equipment for all piers, consisting of exterior and interior overhead electric cranes, as well as industrial trucks and tractors, the closing of the gap between the west and south breakwaters, the extension of the south breakwater, and the opening of a new channel south of the proposed south extension, the dredging of the entire harbor to a depth of approximately 40 feet, the construction of an Oil Depot; the construction of a Coal Depot; the construction of a tunnel under the Pasig River; the construction of warehouses in the rear of the piers, and the construction of additional floating equipment.

BOND ISSUE FOR PORT WORKS.

It is recommended that in order to carry out immediately the most urgent improvements of port facilities at Manila (South Port District), a law which would authorize the issuance of bond in the amount of at least, ten million pesos should be enacted. The sum is only a part of the total estimated cost of ₱40,000,000 needed for the improvement of the entire South Port District.

During the year, a considerable amount of work was also accomplished in the electrical and mechanical field. Plans and specifications, bills of materials, estimates for light systems for eleven buildings, have been prepared, including the Nurses' Home, Philippine General Hospital; the Maternity Ward, Philippine General Hospital; the Dining Pavilion, Philippine General Hospital; the Malacañang Executive Building; the Rizal Hall, University of the Philippines; Normal Hall, Zamboanga, Zamboanga; Tarlac Presidencia, Tarlac, Tarlac; Burawen Presidencia, Burawen, Leyte; Laoag Provincial Building, Laoag, Ilocos Norte; Osmeña Mausoleum, Cebu, Cebu; Tacloban Provincial Building, Tacloban, Leyte, etc., including preliminary wiring plans for the Insular Building, Manila, and the Bureau of Printing machine shops.

Building and detailed plans were furnished for the installation of the Zamboanga Hydro-Electric Generating Station; plans and specifications, including bills of materials, for the Bontoc Electric Light plant; electrical connections, etc., for the second unit of the Trade School power house.

A large volume of correspondence, covering municipal light plants, pumping plants, etc., was handled, and an extensive study made of the Rizal Cement Plant, with a view to evaluating same. Specifications were also prepared for cargo handling equipment to be used on Pier No. 5, including a charging plant for same. Plans were also prepared for pumping plant of the Pagsanjan waterworks.

A considerable number of investigations were made and reports rendered in connection with the rice mills of Bulacan; the standardization of automobiles and trucks; and in connection with public utility cases, pertinent to the request of various electrical concerns, for permission to increase rates for current.

DIVISION OF ARCHITECTURE.

TOMAS MAPÚA and JUAN ARELLANO, *Supervising Architects.*

REPORT OF MR. MAPUA.

The Division of Architecture was not able during the past fiscal year to augment its reduced personnel. This fact, together with the increased cost of labor over the previous year and the scarcity, as well as the high cost of materials has handicapped the efficient prosecution of the building program.

Where limited appropriations have been made for buildings, this division has aimed at designing simple, dignified and as artistic buildings as possible.

The Division of Architecture is urgently in need of competent and efficient architectural designers to cope with the present extensive and constantly expanding building program. The salary offered to this class of technical men is inadequate and for this reason it has been found impossible to secure any from the United States. Moreover, there is a very limited number (only two at this writing) of Filipino students abroad, pursuing architectural studies who might be depended upon in the near future.

In view of the above facts, it is imperative for the Government to take immediate steps to remedy the present situation. More attractive salaries should be offered, especially to American architectural designers and at the same time educate abroad our talented young men in the fine art of architecture.

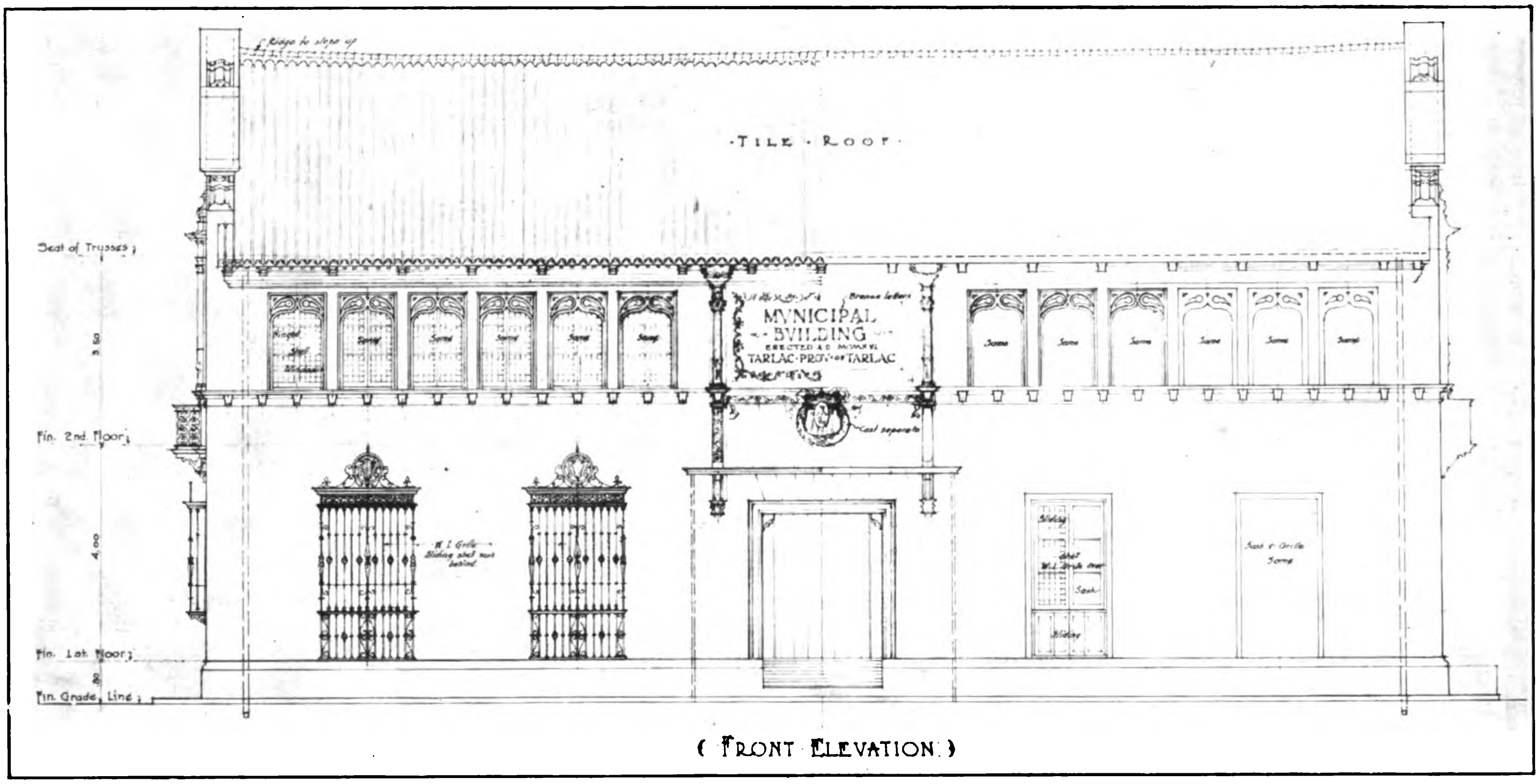
There are so many urgent specific building projects assigned to this division, that it is impossible to give the requisite study necessary to the city planning problems throughout the Archipelago. Furthermore, it is impossible with the limited number of architects, to properly study in advance, the larger architectural problems.

The Architectural Division has a very large volume of work covering a wide range of important and unimportant projects.

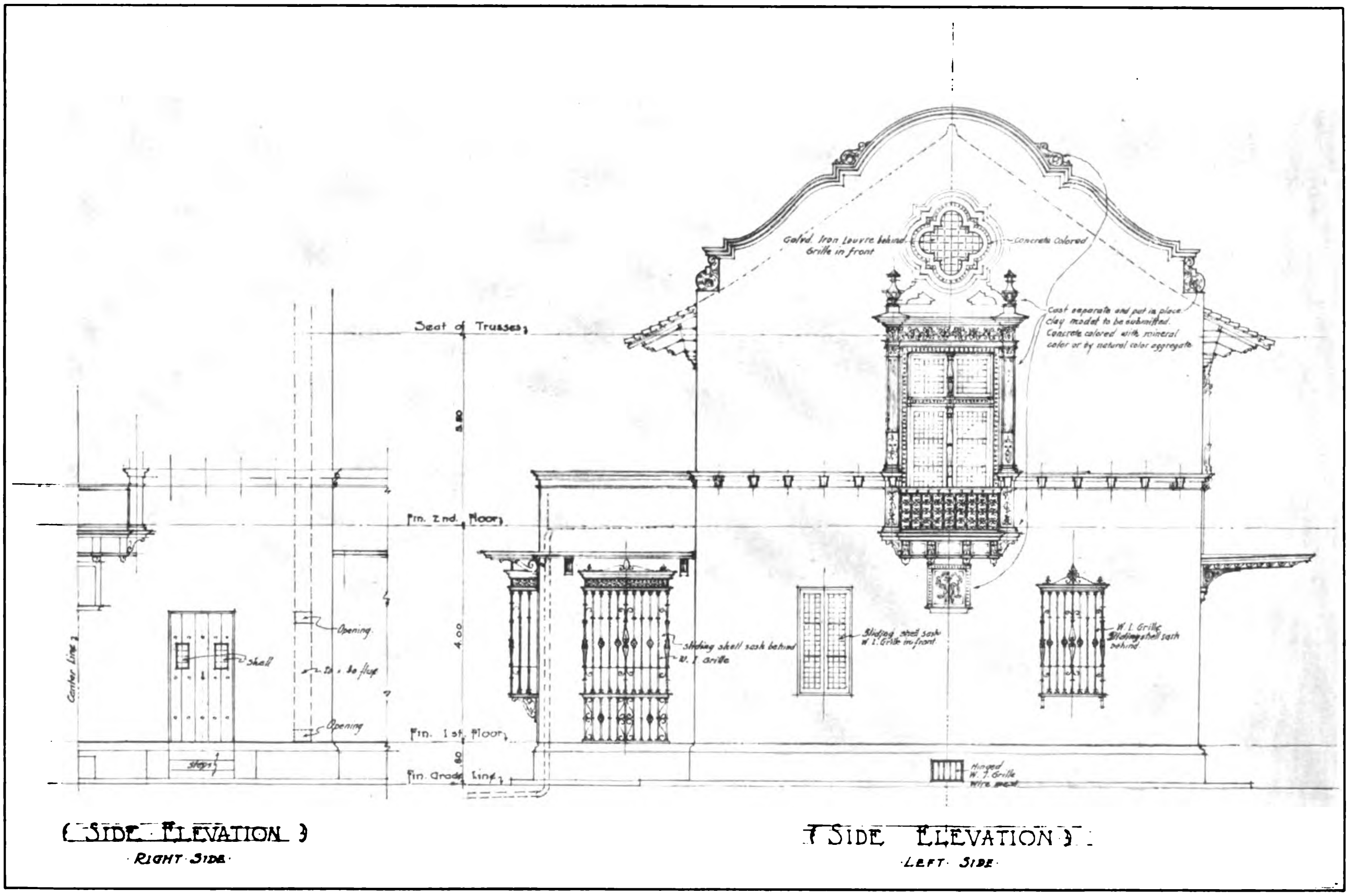
The following list shows the numerous projects assigned for study:

Manila projects.

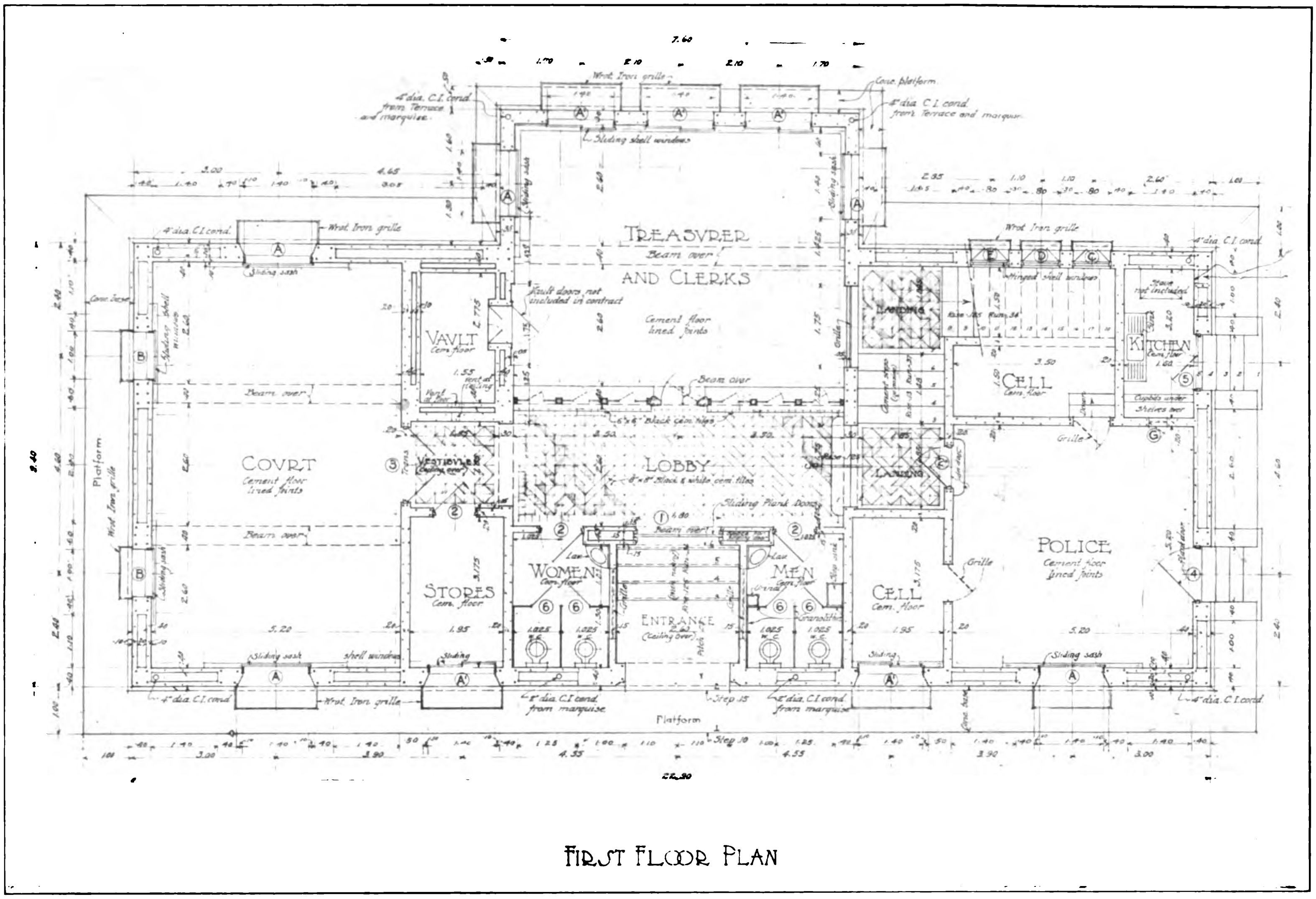
Under construction.	Plans in preparation.	Awaiting action.
Wharf Building.	O'Donnell School.	Changes Burnham Plans.
Malacañang Executive Building.	Alterations, Pier No. 5.	Tondo, Santa Ana Port Area.
Trade School.	Vaults Bureau of Agriculture, Singalong.	Farola.
Nurses' Home, Philippine General Hospital.	Manila High School.	University High School.
Guards' Barracks, Bilibid Prison.	Supreme Court Building.	Alteration Ayuntamiento.
Manila Custom House (new).	Arranque Market.	Santa Lucia Hospital, Philippine Constabulary.
Maternity and Dinnig Pavilion, Philippine General Hospital.	Tomas Claudio Monument.	Bureau of Internal Revenue Building.
Repairs, Postigo Building.	School Deaf and Blind.	Hangars National Guard.
Alteration Intendencia, (Mint).	Chemistry Building, Philippine University.	
Annex Intendencia Building.	Engineering Building, University of the Philippines.	



Front view of Tarlac Presidencia.


Galv'd. Iron Louvre behind Grille in front
Concrete Colored
Cast separate and put in place clay model to be submitted. Concrete colored with mineral color or by natural color aggregate
Seat of Trusses
Fin. 2nd. Floor
Fin. 1st. Floor
Fin. Grade Line
3.50
4.00
.80
Center Line
Shell
Opening
Steps
Sliding shell sash behind W. I. Grille
Sliding shell sash W. I. Grille in front
W. I. Grille Sliding shell sash behind
Hinged W. I. Grille Wire mesh
SIDE ELEVATION
RIGHT SIDE
SIDE ELEVATION
LEFT SIDE

Side view of Tarlac Presidencia.



Detailed first floor plan, Tarlac Presidencia.

Provincial projects.

Under construction.

- Pangasinan Capitol Building.
- Laoag Provincial Building.
- Burawen Presidencia, Leyte.
- Alangalang Presidencia, Leyte.
- Zamboanga General Hospital.
- Zamboanga Tiendas.
- Laoag Normal School.
- Constabulary Barracks and Quarters.
- Tarlac Presidencia, Tarlac.
- Palo Presidencia.
- Iwahig Penal Colony.
- Bulan Presidencia.
- Malasiqui Presidencia, Pangasinan.
- Alteration, Iloilo Custom House.

Plans in preparation.

- Bodegas, Philippine National Bank.
- Tarlac High School.
- Bayombong Hospital, Nueva Ecija.
- Cebu Normal School.
- Bohol Provincial Building and Jail.
- Leper Hospital, Cebu.
- Agusan Provincial Building.
- Peñablanca Presidencia, Cagayan.
- Bulangao Rizal Monument, Pangasinan.
- Lipa Intermediate School, Batangas.
- Wireless Stations.

Awaiting action.

- Capiz Jail.
- Cebu Hospital.
- Layout Municipality, Angeles, Pampanga.
- Pangasinan Hospital.
- Nueva Ecija Court Room.
- Nueva Ecija High School.
- Bontoc Hospital, Mountain Province.
- Iloilo Hospital.
- Samar Capitol Building.
- Palawan Provincial Building.
- Laoag Dormitory Normal School, Ilocos Norte.
- Bontoc Presidencia, Mountain Province.

REPORT OF MR. ARELLANO.

In the distribution of work submitted to the Division of Architecture, the following important projects were assigned by the Director to the undersigned for study:

Manila projects.

Contagious Ward, San Lazaro.
Insane Ward, San Lazaro.
Teachers, Monument.
Insular Capitol Building.
Burnham Memorial.
Entrance Gate, San Lazaro.
Veterinary Research Laboratory.
Jones Bridge.
Post Office.
Rizal Hall Laboratory, University of the Philippines.
Machine Shop Building, Bureau of Printing.
Changes Burnham Plans, Pandacan.
Philippine National Bank (new).
Luneta Band Stand.
Veterinary Science Building, University of the Philippines.

Provincial projects.

Leyte Capitol Building.
Zamboanga Normal School.
Zamboanga Trade School.
Sariaya Rizal Park, Tayabas.
Davao Rizal Monument.
Sibul Midden Shed.
Ilocos Sur Provincial Building.
Philippine National Bank Branch, Iloilo.
Majayjay Market, Laguna.
Iloilo High School and Auditorium.
Tarlac Provincial Jail.
Zambales Provincial Building.
Tayabas Court Room.
Cebu Post Office.
Museum Hill Building, Zamboanga.
A. W. Austin Monument.
Oriental Negros Civic Center.
Cebu Capitol Building.
Batangas Capitol Building.

A digest of some of the work undertaken may be of interest in giving an idea of the work performed.

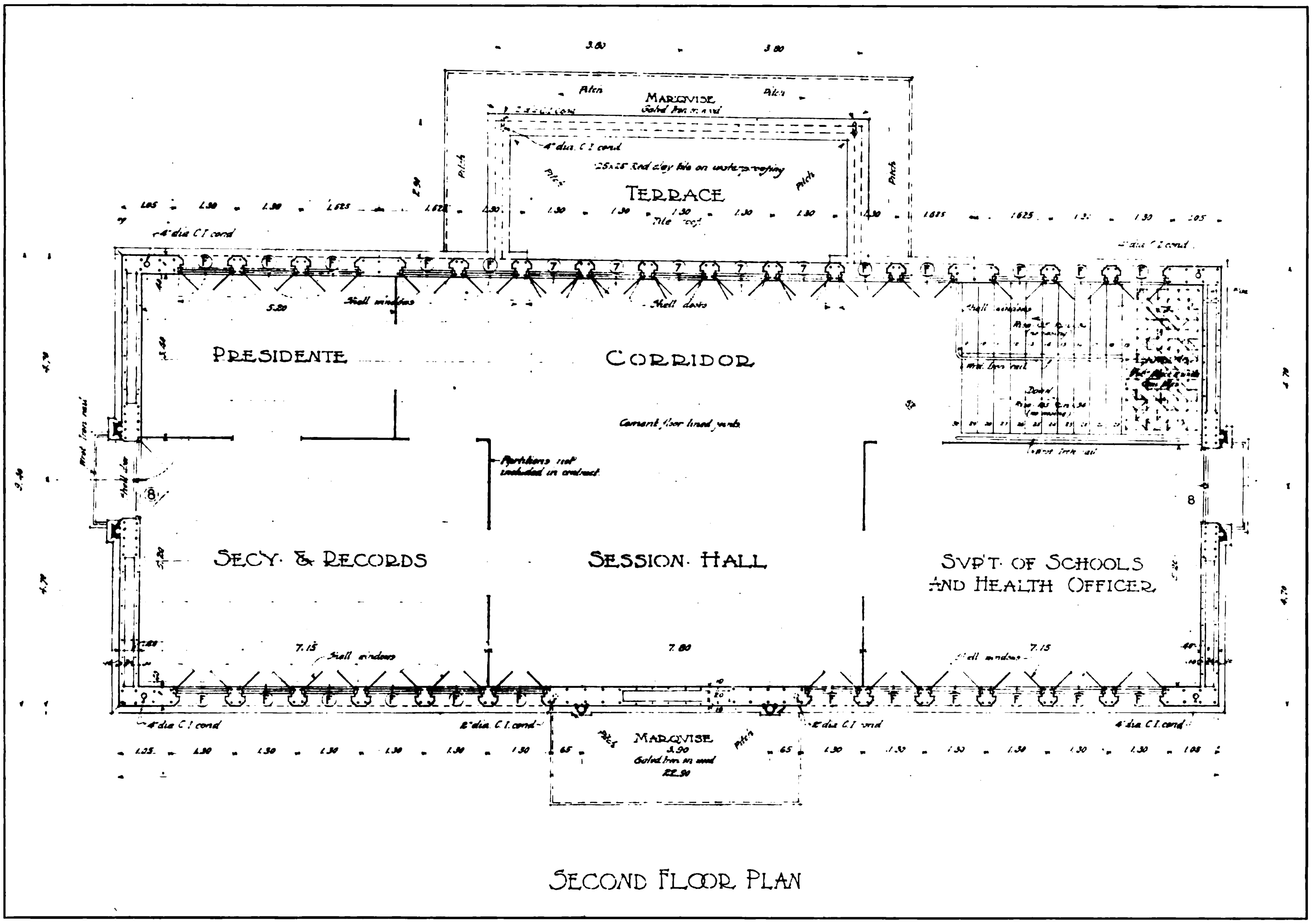
Contagious Disease Ward, San Lazaro, Manila.—This building is already finished and is at present being occupied.

Insane Ward, San Lazaro, Manila.—This building has been occupied for over a year to the satisfaction of the authorities of the Bureau of Health. The decorated cornice, however, is still uncompleted.

Teachers' Monument, Cementerio del Norte, Manila.—Work is now completed.

Insular Capitol Building, Manila.—Piling and foundation work completed to the ground floor level. Proposals for the construction of a portion of the capitol building from the ground floor to the second floor will soon be called for. The amount appropriated to date for this building totals ₱800,000. The total expenditure to date on this building is about ₱550,000 including the completed work, obligations and surcharges. Piling work has been awarded to the Atlantic Gulf and Pacific Company and the foundation work to Tan Samco and Company.

Post Office Building, Manila.—This project has been delayed owing to several expedient changes in the plans and in the selection of the



Detailed second floor plan, Tarlac Presidencia.

site. The piling for the foundation will be advertised for in the near future.

Burnham Memorial, Manila.—Great difficulties have been encountered in the execution of the bronze base of the Flag Pole, for lack of competent artisans for foundry work. These difficulties, nevertheless, have been overcome and the monument is expected to be finished soon.

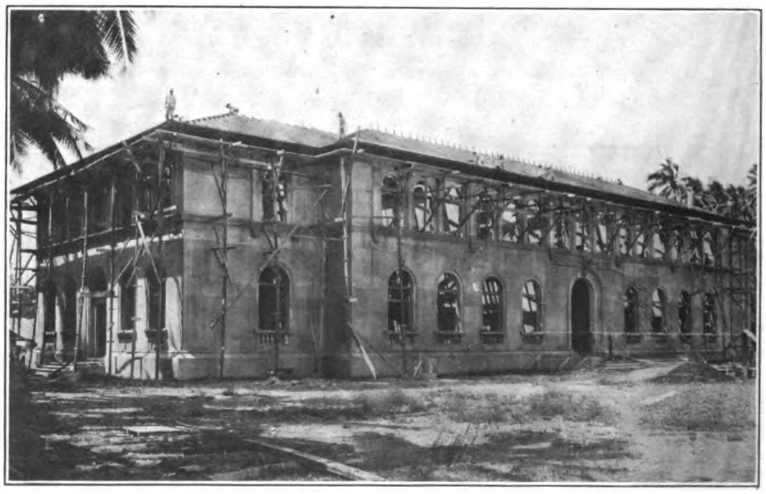
Leyte Capitol Building, Tacloban, Leyte.—Most of the work has been completed, excepting the roof, doors, windows, tile floors, and terrace around the building. The labor question has been a great handicap in its execution and early completion. No reliable laborers could be secured at even higher wages than those prevalent in Manila. The provincial authorities are endeavoring to use this building as a fitting background for a monument to be erected in the plaza in front of the Capitol in honor of the Filipino hero, the late Andres P. Dadizon. Preliminary sketches are being prepared in this division for this proposed memorial.

Zamboanga Normal School, Zamboanga, Mindanao.—Work is progressing slowly on this building owing to the same difficulties as encountered in Leyte.

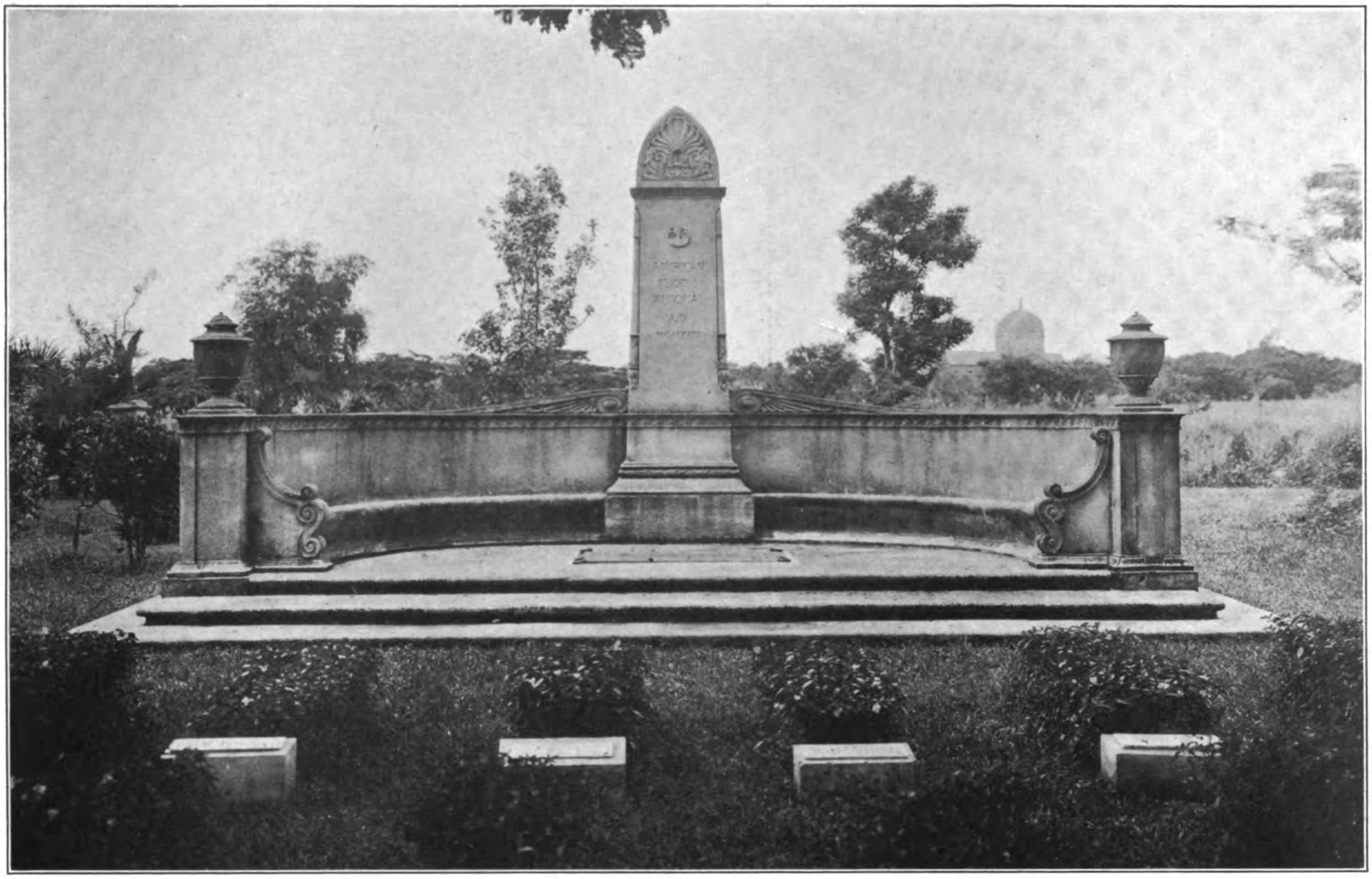
Jones Bridge, Manila.—The work of the substructure in the south side of this project is progressing very rapidly and the architectural features will soon have to be considered. All plans are now complete but the exterior finish of this bridge is under consideration by the authorities of the city of Manila.

Changes of the Burnham Plans, Pandacan, Manila.—All plans for changes, alterations, etc., in the Burnham plans have been submitted and were approved by the city authorities. In their preparation, the following were considered important and pertinent for the economical solution of the problems therein presented. First: The incorporation of the present street system into the Burnham plans by adopting the gridiron system of street layout suggested in the Burnham plans within the areas not affected by existing streets. Second: The elimination of the construction of small bridges by filling in the small esteros and replacing them with culverts.

Rizal Hall, University of the Philippines, Manila.—This structure which will constitute the right wing of the Science Building of the



Zamboanga Normal School, in process of construction.



American Teachers' Memorial, Cementerio del Norte, Manila, P. I.

University of the Philippines is now under construction after the plans prepared by this division. Work is progressing very rapidly and it is expected it will be ready for partial occupancy by next July. Work is being done by administration. To date 1,237 cubic meters of concrete have been put in place.

Zambales Provincial Building, Iba, Zambales.—This work is an additional story to the premises being used at present by the provincial authorities. Plans, specifications, and bills of materials are now complete. Its cost is estimated at ₱90,000.

Philippine National Bank Branch Office, Iloilo, Iloilo.—This building which will be located in a commanding place of the city of Iloilo is to cost approximately ₱190,000. It will house the banking offices of the institution. Its total floor area is 1,035 square meters. Plans and specifications are complete and have been submitted to the Philippine National Bank authorities for approval.

Iloilo High School and Auditorium, Iloilo, Iloilo.—Plans and specifications for these buildings are completed and work has been started. Little progress is noticeable owing to the lack of laborers.

Luneta Band Stand, Manila.—Preliminary sketches were prepared and submitted to the City authorities for action; one calling for a structure to cost ₱15,000 and another for ₱60,000.

Machine Shop Building, Bureau of Printing, Manila.—Plans and specifications of this building are completed and work will soon be started.

Davao Rizal Monument, Mindanao.—Plans and specifications are completed. Work is well advanced, its estimated cost being ₱6,000.

Tayabas Court House, Tayabas.—Plans and specifications completed and submitted to the provincial authorities for action. Its estimated cost is ₱40,000.

Cebu Post Office, Cebu.—Preliminary drawings are completed and submitted to the Director of Posts for approval. Estimated cost is ₱600,000.

Batangas Capitol Building, Batangas.—Preliminary drawings are under study.

Binmaley School, Pangasinan.—Plans and specifications completed.

Majayjay Market, Laguna.—This project is an interesting reconstruction of an old Spanish Mission architecture. Plans and specifications are completed and work is in progress. Its cost will be approximately ₱13,000.

Pasonanka Museum, Zamboanga.—The appropriation for this project is ₱25,000. It is to be located on a hill in the proposed park of Zamboanga. The style selected for this building is Moorish. Preliminary drawings have been submitted to the proper authorities for action.

A. W. Austin Monument, Nueva Ecija.—Preliminary plans have been submitted for disposition.

Oriental Negros Civic Center.—Preliminary plans submitted for action.

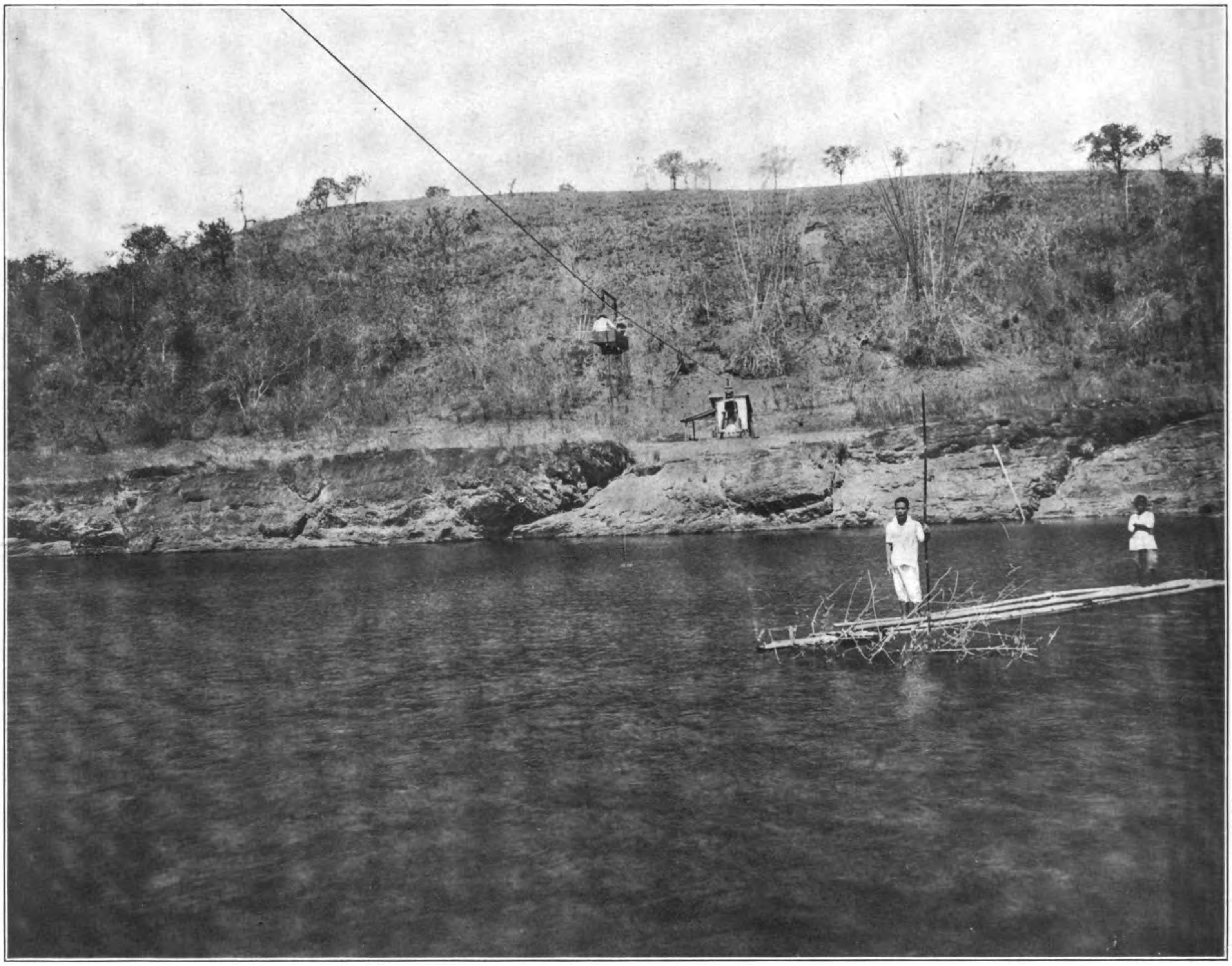
GENERAL CONSIDERATION.

All the projects enumerated above have been undertaken with the small force of draftsmen available and proportional to the appropriation assigned to the division of architecture during the year 1919. Part of the work has been unnecessarily delayed for no other reason than the shortage of an adequate personnel. With the present appropriation, it is hoped, however, that this division will be able to cope with the volume of work entrusted to same provided additional and competent architectural designers are secured.

IRRIGATION DIVISION.

A. D. WILLIAMS, *Chief Irrigation Engineer.*

In the report of this division for last year it was pointed out that the absence of many of the engineers of the division in the military service had hampered greatly the activities of the division. The



Cable gaging station on Angat River near Norzagaray, Bulacan Province.

lack of technical personnel, together with high prices and the difficulty in obtaining materials during the first part of the present year continued to delay an active program for the construction of irrigation and waterworks projects. These conditions improved during the latter part of the year and permitted the division to substantially increase its activities.

HYDROGRAPHIC INVESTIGATIONS.

The hydrographic investigations which were resumed in 1918 were extended during the year to include most of the important streams for irrigation and power purposes on Luzon and in the Visayan Islands. A number of gaging stations were also established in the provinces of Cotabato and Lanao, Mindanao. There were a total of 108 permanent gaging stations in 23 provinces being maintained at the end of the year at which gagings were regularly made by hydrographers of the division. In addition to the operation of these stations miscellaneous gagings were made of 23 streams in connection with applications for water rights and the determination of old rights. Complete records, including data collected by the old Irrigation Division during 1908 to 1912, are now availble for 28 gaging stations covering periods of from one to four years. In order that these records and other hydrographic data on hand be made more readily available for use in irrigation and power development by private parties it is recommended that they be compiled and published in bulletin form as is done in the United States and Hawaiian Islands.

TOPOGRAPHIC SURVEYS.

During the year topograhic surveys were completed of the following irrigation projects covering a total area of approximately 50,000 hectares:

Naic Irrigation Project, Province of Cavite.
Laoag-Vintar Irrigation Project, Province of Ilocos Norte.
Talavera River Irrigation Project, Province of Nueva Ecija.
Mangatarem Irrigation Project, Province of Pangasinan.
San Fabian Irrigation Project, Province of Pangasinan.
Mariquina Valley Irrigation Project, Province of Rizal.
San Marcelino Irrigation Project, Province of Zambales.

The survey of the following projects is in progress with surveying parties still in field:

Pauili Valley Irrigation Project, Province of Ambos Camarines.
Lanao Irrigation Project, Province of Bataan.
Maragondon Irrigation Project, Province of Cavite.
Candon Irrigation Project, Province of Ilocos Sur.
Pampanga River Irrigation Project, Province of Nueva Ecija.
Peñaranda River Irrigation Project, Province of Nueva Ecija and Bulacan.
Murong Irrigation Project, Province of Nueva Vizcaya.

The area of land to be irrigated by these projects is estimated at 45,000 hectares. The cost of making topographic surveys has averaged about ₱0.75 per hectare.

Trinidad drainage canal. Section west of the Baguio–Trinidad Road, Benguet, P. I.

IRRIGATION PROJECTS APPROVED FOR CONSTRUCTION.

Insular and municipal irrigation projects were approved for construction during the year under the provisions of Acts Nos. 2152 and 2755, respectively, as given below. Allotments aggregating ₱1,109,000 were authorized from funds appropriated by Acts Nos. 2736 and 2786 to start construction work. These projects will irrigate a total area of 21,814 hectares and are estimated to cost completed ₱2,378,500.

Project.	Province.	Irrigation area.	Estimated cost.	Allotment authorized.	Remarks.
		Hectares.			
Amburayan River	La Union	4,500	₱642,000	₱200,000	Insular system.
Baruyen River	Ilocos Norte	1,000	56,000	56,000	Do.
Dingras	do	1,200	106,000	106,000	Do.
Santa Barbara	Iloilo	4,000	436,000	250,000	Do.
Tagudin	Ilocos Sur	1,300	100,000	100,000	Do.
Trinidad	Benguet	200	40,000	40,000	Do.
Talavera River	Nueva Ecija	8,000	928,000	310,000	Do.
Dipolog	Zamboanga	1,000	42,000	28,000	Municipal system.
Ayala	do	183	7,500	5,000	Do.
Santa Maria	do	431	21,000	14,000	Do.
Total		21,814	2,378,500	1,109,000	

Plans have been prepared and construction work authorized on the Baruyen River, Santa Barbara, Trinidad, Dipolog, Ayala and Santa Maria projects. The necessary plans have also been prepared for starting the construction of the Talavera River Irrigation Project, but a protest received from a number of land owners against the inclusion of land irrigated by an old irrigation system has held up construction work. Recommendations have been submitted that the land served by the old project be excluded from the system to be constructed by the Government. It is believed that this recommendation will meet with the approval of the majority of the interested land owners and will receive favorable action, in which case the construction of this project can be undertaken in accordance with the revised plans at an early date. Irrigation notices have been published and served on interested land owners for the remaining projects as required by law, and construction work may be authorized on same in accordance with the provisions of the Irrigation Act on or before February 15, 1920.

The district engineer organizations are being utilized in the construction of irrigation projects whenever the work can be handled to advantage in this manner. In the case of the larger projects which cannot be handled to advantage by district engineers, project engineers are assigned in charge of the work. The project engineers will work under the supervision of district engineers in most cases but in some instances it has been considered advisable to have them report directly to the Chief of the Irrigation Division.

Funds for construction purposes are being deposited as a rule with provincial treasurers for disbursement under a special arrangement whereby provinces will be paid a surcharge of 1 per cent for this service, making the total surcharge for insular projects, 10 per cent. For the larger projects special disbursing officers are required, especially when construction work is accomplished by administration.

In designing irrigation projects considerable attention has been given to developing standard plans for canal structures. This standardization of design will effect a great saving in time and expense in the preparation of plans in the future.

PROJECTS RECOMMENDED FOR CONSTRUCTION.

In addition to the irrigation projects approved for construction, the construction of the following municipal projects was recommended:

Pililla Irrigation Project, Province of Rizal.
Morong Irrigation Project, Province of Rizal.
Balaoan Irrigation Project, Province of La Union.
San Fabian Irrigation Project, Province of Pangasinan.
Mangatarem Irrigation Project, Province of Pangasinan.

All the above projects contemplate the improvement and extension of existing municipal irrigation systems and should therefore be financed under the provisions of Act No. 2755. The total estimated cost of construction of such projects is ₱227,000 to irrigate an area of 6,600 hectares. Preliminary plans have been prepared and construction can be undertaken as soon as the municipalities concerned finance the cost of the proposed systems in accordance with the provisions of Act No. 2755.

IRRIGATION PROJECTS UNDER CONSIDERATION.

A large number of requests have been received during the year from provincial boards, municipal councils, and private parties for the investigation or construction of proposed irrigation systems. The division has given considerable time to furnishing information in connection with these requests. Where little or no data were available on proposed systems preliminary investigations have been made by district engineers or engineers of the division and reports submitted covering the importance and feasibility of systems. The more important projects under consideration with the hectarage and status of each are given in the table in the next column.

From that table it will be noted that the Bureau has under consideration 45 important projects in 20 of the principal rice producing provinces that would benefit a total area of about 300,000 hectares. In addition to these projects there are a number of proposed irrigation systems pending investigation for which little or no data are available. Topographic surveys and preliminary investigations have been completed for 20 projects that cover a total area of approximately 130,000 hectares. In order that a more definite and systematic policy may be pursued in developing these projects, legislation is recommended that would provide funds to be invested in the construction of irrigation systems over a fixed period of years instead of depending on annual appropriations for this purpose. For some of the larger projects, it will take several years to make the necessary preliminary investigations, plans and estimates and from three to five years to accomplish construction work. The recent rice shortage has emphasized the importance of irrigation in the Philippines to insure the rice harvest and to increase the yield of rice.

MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS.

The San Miguel irrigation system in Tarlac Province and the Pilar irrigation system in Bataan Province were maintained and operated under the supervision of the division during the year at a cost of ₱9,073.66 and ₱1,450.47, respectively. The total income from the San Miguel system was ₱11,845 and the net income from the Pilar system ₱1,394.69. The San Miguel system suffered considerable damage in the August flood due to an island of sand forming in the river above the diversion weir and big trees lodging on the weir. This caused the river to destroy the up-stream protection dyke and to cut a new channel to the east of the headworks. A short section of the main canal and several canal structures were completely destroyed and a large amount of sand deposited in the main canal above the settling basin. It has been decided to make temporary repairs consisting of a pile dyke, to replace the earth dyke, and to force the river to fill in the new channel during the coming rainy season. If this plan is successful it will effect a considerable saving, since earth dykes with rock paving are estimated to cost over ₱100,000. The "Compañía General de Tabacos de Filipinas," which own the land under the system was furnished a continuous supply of water by maintaining a temporary heading during the time that the main canal was being reconstructed to take water at the diversion weir, which was not damaged.

Drainage canal under construction, Trinidad Valley, Benguet Province.

Projects under consideration.

Province.	Project.	Estimated area.	Status.
		Hectares	
Albay	Quinale Lake Bato project	6,000	Awaiting investigation.
do	Malinao-Tabaco project	600	Do.
Ambos Camarines	Colassi irrigation project	2,000	Do.
do	Pauili valley irrigation project	10,000	Investigation in progress.
do	Barit River irrigation project	2,000	Awaiting investigation.
do	Uarus River irrigation project	2,000	Do.
Antique	Sibalom irrigation project	3,000	Preliminary survey completed.
Bataan	Dinalupihan irrigation project	2,500	Do.
do	Orion irrigation project	1,270	Topographic survey completed.
do	Lumao irrigation project	300	Investigation in progress.
Bulacan	Norzagaray irrigation project	30,000	Topographic survey completed.
Cavite	Naic Estate irrigation project	700	Recommended for construction.
do	Maragondon irrigation project	800	Investigation in progress.
Ilocos Norte	Laoag-Vintar irrigation project	3,000	Topographic survey completed.
do	San Nicolas irrigation project	4,000	Preliminary investigation, 1910.
Ilocos Sur	Abra River irrigation system	10,000	Topographic survey completed.
do	Candon irrigation project	3,000	Investigation in progress.
Iloilo	Jalaur River irrigation project	18,500	Topographic survey completed.
do	Aganao River irrigation project	3,000	Do.
do	Pototan irrigation project	2,300	Survey and preliminary design made.
do	Cordova irrigation project	1,000	Topographic survey completed.
Isabela	Magat River irrigation project	40,000	Awaiting investigation.
La Union	Balaoan irrigation project	1,200	Recommended for construction.
do	Agoo-Tubao irrigation project	2,000	Awaiting investigation.
do	Naguilian irrigation project	1,000	Do.
do	Rosario irrigation project	1,000	Investigation in progress.
Leyte	Barugo irrigation system	1,000	Preliminary survey made.
do	Dagami-Tanauan irrigation system.	14,000	Preliminary investigation, 1910.
do	Bato-Hilongos irrigation project	3,500	Do.
Nueva Ecija	Pampanga River irrigation project.	20,000	Investigation in progress.
do	Peñaranda irrigation system	10,000	Do.
Nueva Vizcaya	Murong irrigation project	800	Do.
Occidental Negros	Binalbagan irrigation project	3,000	Awaiting investigation.
do	Bago irrigation project	10,000	Do.
do	Silay irrigation system	5,000	Do.
Pampanga	Porac River irrigation project	1,000	Do.
do	Bamban River irrigation project	3,000	Do.
do	Gumain River irrigation project	5,000	Do.
Pangasinan	Agno River irrigation project	30,000	Topographic survey made. 1910.
do	Mangatarem irrigation project	2,000	Recommended for construction.
do	San Fabian irrigation project	4,000	Do.
Rizal	Mariquina Valley irrigation project.	5,000	Topographic survey completed.
Tarlac	Capas irrigation project	5,000	Awaiting investigation.
do	Tarlac irrigation project	30,000	Do.
Zambales	San Marcelino irrigation project	4,000	Topographic survey completed.
	Total	307,470	

Some repair work was performed on friar lands estates irrigation systems in the Provinces of Cebu, Cavite and Laguna by the district engineers under the supervision of the division. The operation of these systems is under the Bureau of Lands.

WATER RIGHTS.

The Division received a total of 158 applications for water rights during the year for irrigation and industrial purposes. Twenty-four applications were considered, twenty-one of which were granted by the Secretary of Commerce and Communications and three disapproved, upon the recommendation of the Irrigation Council. The remaining applications have been advertised and investigated as required by law and are now pending action by the Irrigation Council. The water rights granted appertain to 1,162 hectares of irrigable land. A total of 417 applications for water rights have been granted since the passage of the Irrigation Act in 1912 for irrigating 50,353 hectares.

Of equal importance to the development of irrigation in the Islands is the work that is being accomplished in the determination of existing water rights. Thus far complete adjudications have been made on eleven different streams involving 1,758 separate rights or parcels of land. These determinations affect the title to water for the irrigation of 8,032 hectares of land.

Surveys have been completed and maps prepared showing all water right locations on fourteen different streams. These surveys include approximately 50,000 hectares of irrigated land. The streams, including all their tributaries, which have been surveyed and are now pending adjudication are given in the following table:

Stream.	Province.	Number of diversion ditches.	Length of main canal in meters.	Number of municipalities affected	Number of hectares irrigated.
					Area.
Pilar	Bataan	5	9,900	1	1,453.8
Calaguiman	do.	11	18,600	1	481.5
Pansol	do.	4	300	1	41.4
Talisay	do.	16	18,650	2	782.4
Sierra Bullones	Bohol	26	18,300	1	347.0
Maitim	Laguna	1	2,000	1	1,230.1
Ange	Pampanga	3	4,000	1	1,200.0
Gogo	do.	24	42,270	4	4,000.0
Nayon	Pangasinan and Zambales	20	29,320	2	1,175.3
Bued	Pangasinan, Union, and Mountain Province	50	33,180	6	5,136.0
Baliwag	Nueva Ecija and Tarlac	210	85,465	7	22,999.5
O'Donnel, Moriones, and Tarlac	Tarlac	1	4	7	10,114.0
Total area					48,961.0

The division is at present several years behind in this work due to the lack of clerical and technical assistance. The system is simple, but the filing, indexing and tabulating of rights, and the correspondence with claimants, involve a large amount of clerical work which requires office assistants with several years experience.

The streams, in addition to those mentioned above which have been designated for adjudication on which no work has been accomplished are given in the following table:

Stream.	Province.	Municipality affected.	Approximate land irrigated.
			Area.
Nasisi	Albay	Ligao and Oas	1,000
Ynarihan	Ambos Camarines	Naga, Magarao, and Cabalanga	1,200
Maoguingoguing	Ilocos Norte	Vintar	500
Nagsincaoan	Ilocos Sur	Cabugao	300
Ubbog	do	do	200
Parasapas	Pangasinan	Tayug and Natividad	300
Gogo and Buge	Tarlac	Concepcion	1,000
Balingasay	Ilocos Norte	Sarrat	300
Banila	Pangasinan	Rosales, Baluñgao, and Umingan	2,000
Total area			6,800

AMENDMENT TO IRRIGATION LAW AND BOND ISSUE FOR IRRIGATION SYSTEMS.

A proposed Act which will amend and compile the laws relative to the appropriation of public waters for the development of water power and the use of public lands in relation thereto, and which would change the present policy of the Government in allowing titles to waters and lands valuable for water power to pass permanently into the hands of private parties or corporations, and retain control of these valuable resources in the people though permitting their development and use through private enterprise, is another measure that deserves the preferential attention of our legislators. Such a proposed Act, if it is to be submitted to the Philippine Legislature, must be so worded as to provide a definite policy, which is essential, and should secure the capital needed for the proper development of water power sites as rapidly as the public interest may require.

In order to increase the food production of the Islands and remedy the shortage of rice which has been experienced in the past, and at the same time help the provinces and municipalities construct irrigation system, a proposed Act authorizing provinces and municipalities to incur indebtedness not to exceed seven per centum of the aggregate tax valuation of their property, and to issue bonds covering the amount of said indebtedness payable in gold coin of the United States or its equivalent in Philippine currency, for the purpose of providing funds to construct irrigation systems, should be passed.

WATER SUPPLY SYSTEMS.

The difficulty in obtaining pipe has been responsible for delayed progress in the construction of water supply projects. Pipe ordered in the United States in November, 1918, was not received at the Bureau of Supply until a year later. The high price of pipe has also made it necessary to use light weight riveted steel pipe for many systems that would have been constructed of cast iron pipe in normal times. Plain concrete pipe, manufactured in accordance with standard drawings prepared by the Division, has been employed at a considerable saving in cost for heads not exceeding 10 meters. A complete list of water supply systems under construction are given below. These systems are estimated to cost completed ₱1,900,000 and will serve a total population of about 175,000.

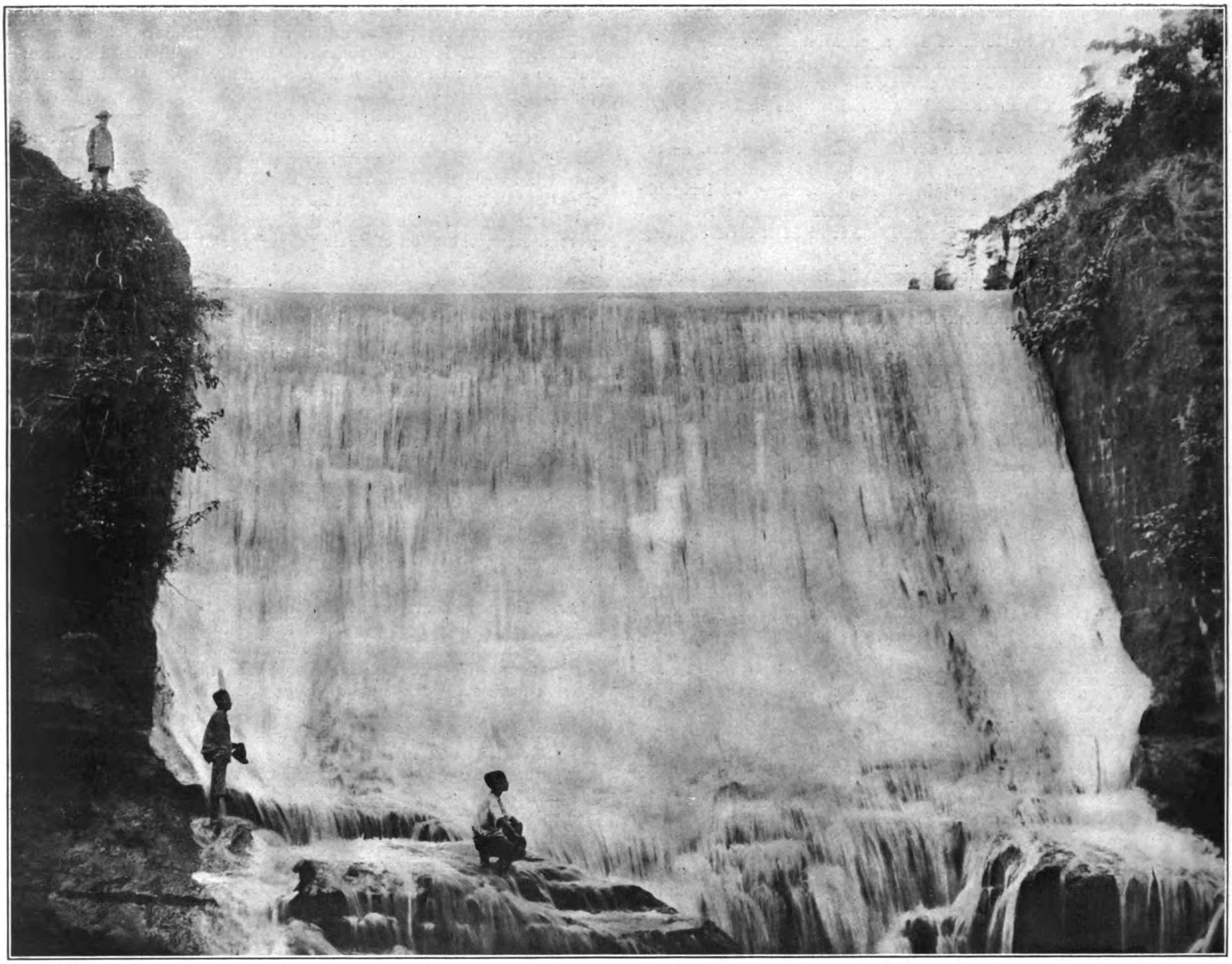
In the tabulation on page 30 are included all system upon which some work has been done during the year. In a few cases the amount of work done this year is small, *e. g.*, upon those systems that were nearly completed in preceeding years, and upon those systems to begin for which a preliminary appropriation has been made.

Some of the most interesting of the systems are described below. An appropriation was made this year for the water supply system at Bangued, Abra Province. The money which the municipality must furnish will be realized by the sale of bonds under a recent special Act of the Legislature. A large spring situated 130 meters above the town and about 8,600 meters distant will be utilized as the source of supply. The water from the spring will be conveyed through a 6-inch concrete pipe and 4-inch riveted steel pipe to a 117,000 gallons reservoir. The distribution system will consist of riveted steel and G. I. pipes. The estimated cost of the system is ₱99,000.

The Lemery system is an extension of the Taal water system, Batangas Province, completed in previous years. The water for Lemery is furnished by the Taal pumping plant and is distributed in Lemery thru 8-inch, 6-inch, and 4-inch cast iron pipes. The system is estimated to cost about ₱42,000.

The Lipa, Batangas, waterworks will cost ₱88,000. There will be two sources of supply, viz., an artesian well in Lipa, and a spring near the town. At the artesian well a deep well pump will be installed to be driven by a crude oil engine with an electric motor as secondary equipment to be used in emergency. The motive power at the spring will be electric, the electricity being furnished by the Lipa Electric Company during the night hours when their load is low. The distribution system in Lipa consists of 3,200 meters of 3-inch G. I. pipe. A reservoir of 117,000 gallons capacity is located on a nearby hill at sufficient elevation to furnish water for domestic supply. This reservoir is connected to the distribution system by 700 meters of 7-inch riveted steel-joint pipe. In future an additional reservoir and a booster fire pump can be installed for fire protection purposes.

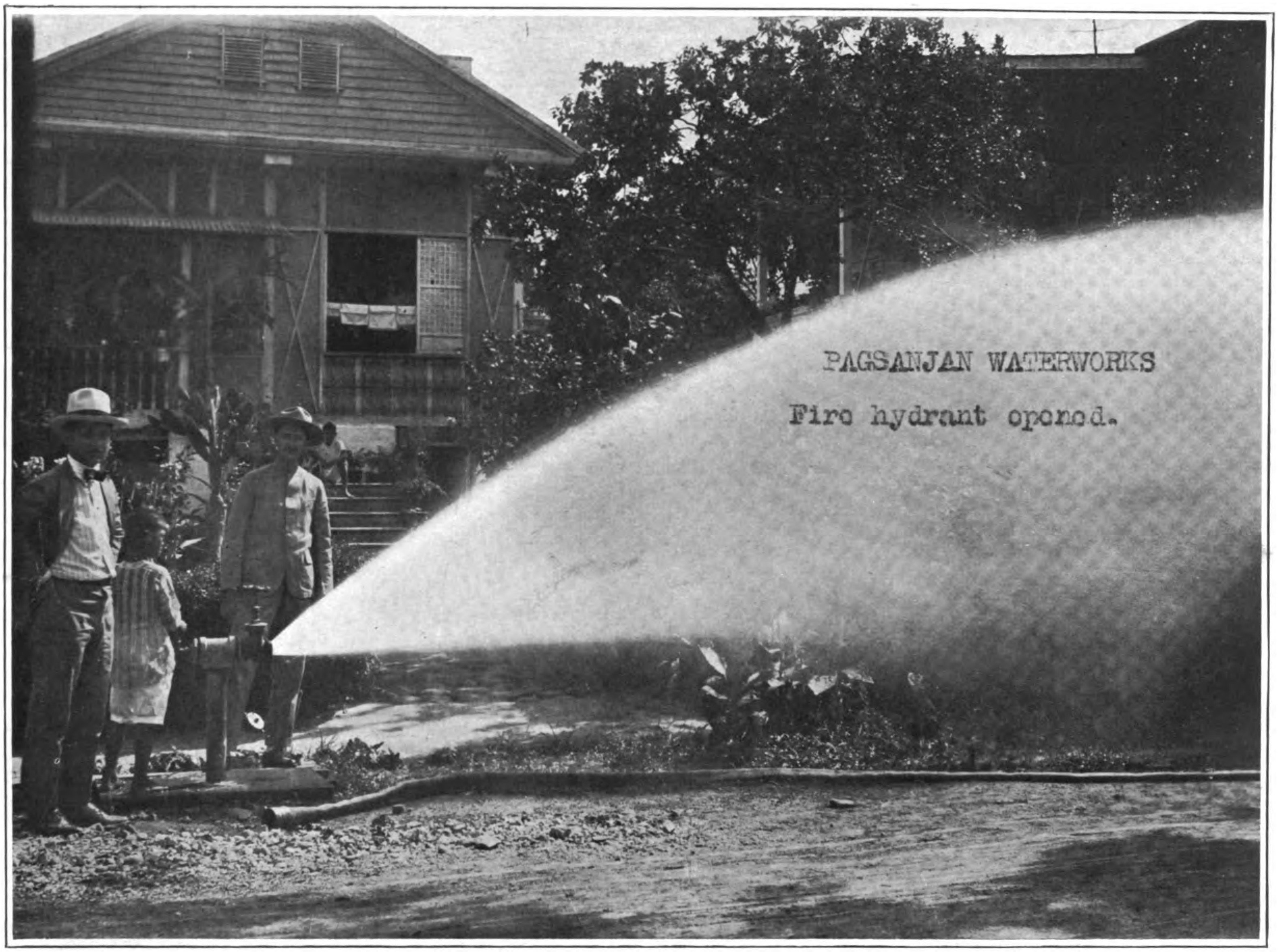
The construction of a small system to supply water for domestic use only to the municipality of Hagonoy, Bulacan, has been completed at an approximate cost of ₱3,300. The source of supply is an artesian well flowing into reinforced concrete stand pipe whence the water is distributed to the town through 2-inch and 1½inch G. I. pipes.



Masonry dam on friar lands, Cavite Province.

Water supply systems done during the year.

Province.	Municipality.	Type of system.	Population to be served.	Estimated cost.
Abra	Bangued	Gravity	6,600	₱99,000
Antique	San Jose	Pumping	4,000	40,000
Batangas	Batangas	do	3,000	53,000
Do	Lemery	Gravity	9,000	42,000
Do	Lipa	Pumping	5,000	88,000
Do	San Jose	Gravity	5,000	34.000
Bohol	Jagna	do	3,000	15,000
Do	Tubigon	Pumping	5,000	30,000
Bulacan	Hagonoy	Gravity	850	3,200
Bukidnon	Malaybalay	do	1,300	6,700
Cavite	Mendez-Nuñez	Hydro-electric	1,600	50,000
Do	Silang	Pumping	4,000	47,000
Cebu	Carcar	Gravity	8,000	35,000
Do	Catmon	do	1,800	15,300
Do	Dumanjug	Pumping	2,500	30,000
Do	Ginatilan	Gravity	2,000	8,500
Do	Malabuyok	do	1,500	7,000
Do	Opon	Pumping	1,500	28,000
Do	Poro	Gravity	2,000	8,000
Do	Samboan	do	2,000	4,100
Do	Tudela	do	1,000	7,000
Davao	Davao	do	6,000	80,000
Laguna	Bay	do	2,600	4,300
Do	Majayjay	do	4,000	33,000
Do	Nagcarlan	do	4,000	33,000
Do	Pagsanjan	Pumping	6,000	60,000
Do	Santa Cruz	do	6,000	70,000
Mindoro	Abra de Ilog	Gravity	400	5,300
Do	Calapan	Pumping	1,000	
Misamis	Balingasag	Gravity	3,234	
Do	Cagayan	Pumping	3,000	33,000
Mountain Province	Baguio	Gravity	4,000	100,000
Do	Cervantes	do		
Oriental Negros	Dumaguete	Pumping	5,000	
Do	Luzuriaga	Gravity	2,900	12,000
Palawan	Bacuit	do	1,000	3,100
Pampanga	Arayat	do	4,800	13,200
Sorsogon	Bacon	do	4,000	21,000
Sulu	Jolo	Pumping		
Surigao	Gigaquit	Gravity	5,000	7,5000
Do	Lianga	do	700	
Do	Placer	do	1,500	11,000
Tayabas	Gasan	Pumping	2,100	15,000
Do	Lucban	Gravity	4,000	40,000
Do	Lucena	do	8,750	325,000
Do	Malbog			
Do	Mogpog	Gravity	1,600	8,600
Do	Santa Cruz	do	3,200	20.000
Do	Tayabas			
Zambales	San Antonio	Gravity	5,000	71,000
Zamboanga	Zamboanga	do	18,000	300.000
Total			173,434	



Fire hydrant opened. Pagsanjan Waterworks, Laguna Province.

At Tubigon, Bohol, a waterworks system is being constructed at a cost of ₱30,000. The source of supply is a spring that has been used for many decades by the inhabitants. At the spring a 10-horse power crude oil engine is being installed, belt-connected to a centrifugal pump which will pump water into a tank on a nearby hill, whence it will flow by gravity to town.

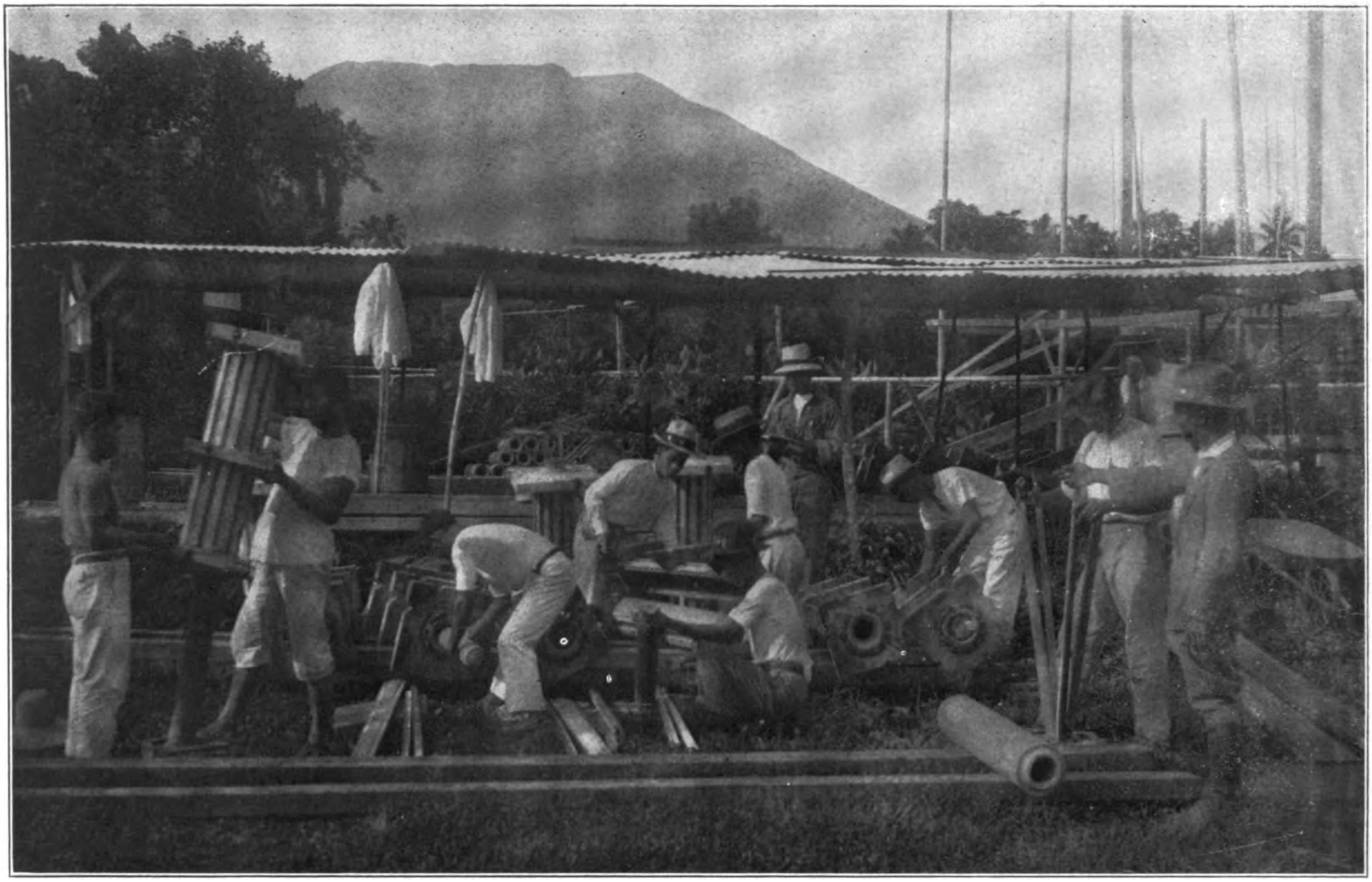
At Mendez-Nuñez, Cavite Province, an interesting system is being intalled. On the Lake Taal slope of the mountain, a large stream of 600 gallons per minute furnishes power by means of a Pelton-Francis wheel to pump 40 gallons of water per minute over the mountain divide at an elevation of 362 meters above the pump to Mendez-Muñez 5,700 meters distant. The penstock leading to the turbine will be a combination of 8-inch, 10-inch and 12-inch riveted steel pipes and the discharge pipe will be 2½-inch G. I. Above Mendez-Nuñez a reservoir in the adobe rock has been excavated. Provision is made at the power plant to install a generator in the future, driven by the same water wheel, to light Mendez-Nuñez. The estimated cost of the system is ₱50,000.

The Silang water system, Cavite Province, is a combination of a gravity system for the town of Silang and a hydraulic ram system to supply water to the barrios of Lucsuhin and Litit of the same municipality. Both systems will provide water for domestic purposes only. The gravity system for Silang is to consist of 8-inch and 6-inch concrete pipe, and 3-inch and 2-inch G. I. pipe for the distribution system. The system to supply water to Lucsuhin and Litit will consist of an hydraulic ram, a 40,000 gallon reservoir, 8-inch and 6-inch concrete pipe, and 4-inch, 3-inch, and 2-inch G. I. pipe for distribution purposes. The cost of the whole system complete is estimated at ₱47,000.

The Dumanjug water system, Cebu, has an artesian well as source. The water is pumped at a rate of 60 gallons per minute to a 40,000 gallon reservoir located on a hill about 37 meters higher than the town. The system is estimated to cost about ₱30,000, and will provide for one fire stream of 125 gallons per minute in town. Five-inch riveted steel pipe and 3-inch and 1½-inch G. I. pipe will be used in this project.

The source of supply for Carcar waterworks, Cebu Province, is a large spring flowing 10,000 gallons per minute situated 7,000 meters from town. Six thousand six hundred meters of 5-inch concrete pipe will convey the water under small pressure to a small stand pipe one-half kilometer from town from which point a pressure line of 500 meters of 7-inch riveted steel pipe to town will be used. The distribution system consists of a gridiron of 3-inch G. I. pipe. An abundance of water for domestic use is assured, and later by the use of a booster fire pump, water for fire protection under pressure can be obtained. The cost of the system will be ₱35,000.

The municipality of Davao, Davao, will be supplied with water from a spring located about 3,000 meters from town and 48 meters above it. The minimum flow of the spring has been 20,000 gallons per day. A main line of 4-inch riveted steel pipe will convey the water from the spring to a 450,000-gallon reservoir of the same type as the one used in Lucena, Tayabas. The reservoir will be connected



Casting 4-inch concrete pipe, Majayjay Waterworks, Laguna Province.

with the distribution system by a line of 7-inch steel pipe, and 8-inch cast iron pipe brought from Jolo. The distribution system within the town consists of 4-inch cast iron pipe. The system is estimated to cost about ₱80,000 when completed.

A gravity system is being built at Majayjay, Laguna Province. The supply is from a spring about 3,000 meters from the town and 240 meters above it. The system consists of 4-inch concrete pipe, 4-inch G. I. pipe and 3-inch and 2-inch G. I. pipe. The cost of this system is estimated to be ₱33,000. Provision was made in this system for a future extension to the municipality of Magdalena.

The Nagcarlan water system, Laguna, is very much similar to that at Majayjay. The water is conveyed by gravity from a spring 3,500 meters distant and about 110 meters above the town, through 5-inch and 4-inch concrete pipe and 4-inch and 3-inch G. I. pipe. One stream of 120 gallons per minute will be available for fire protection. Thirty-three thousand pesos is the estimated cost of the system.

In the Santa Cruz waterworks, Laguna Province, an elevated reinforced concrete tank of 100,000 gallons capacity is used. The source of supply is an artesian well. The water is pumped by means of a centrifugal pump belt-connected to a 15 horse-power crude oil engine into the tank. Distribution lines of 5-inch, 4-inch, 3-inch, and 1½-inch G. I. pipe are used within the town. An additional pumping unit consisting of a pump direct-connected to a 40 horse-power gasoline engine is being used to provide for two fire streams of 125 gallons per minute each, for fire protection. The estimated cost is ₱70,000.

A new type of 50,000 gallons elevated reinforced concrete tank has been designed for the Cagayan water system, Cagayan Province. The water is pumped from an artesian well to the elevated tank at the rate of 60 gallons per minute, to supply water for domestic purposes only. Service lines of 4-inch, 3-inch, 2-inch and 1½-inch G. I. pipes are laid within the town for distribution of the water. Thirty thousand pesos is the estimated cost of the system.

Due to the increasing number of people patronizing Baguio, the water supply last year (which was a record breaking dry year) proved insufficient. To supplement the present supply it is contemplated to utilize other springs situated on the west slope of the mountain range of which Topside is the sourthern extremity. These springs will provide for Baguio a large increase of water under gravity pressure. The new pipe line consists of concrete pipe where the pressure is low, and wood-stave and riveted steel where the pressure is high. Due to the fact that no *anay* are present in Baguio, it has been considered safe to employ wood-stave pipe there. To defray the cost of these improvements ₱25,000 was appropriated from this year's Insular funds.

The source of supply for Dumaguete waterworks, Oriental Negros is a large spring flowing about 480 gallons per minute, located at a distance of about 790 meters from town. A centrifugal pump and a 15 horse-power crude oil engine are being used to pump the water from the spring through 6-inch riveted steel pipe to an elevated reinforced concrete tank of 100,000 gallons capacity, of the the same type as the Cagayan tank. The distribtion system within the town consists of 3-inch G. I. pipe. The estimated cost is ₱47,000.

A small gravity system is under construction to supply water for domestic purposes to Arayat, Pampanga. Baño spring, source of the present system, is located about 6 meters higher than the town and at a distance of about 2,300 meters. Its minimum flow is 70 gallons per minute. Concrete pipes of 7-inch and 4-inch diameter have been used in this system. It is estimated to cost ₱13,200.

The Lucban waterworks system, Tayabas Province, contemplates taking its supply from a large spring. The water will be conveyed to the town by gravity through a main line of 4-inch concrete pipe to a concrete tank. From the tank 5-inch riveted steel pipe will be used as far as the distribution system where a gridiron of 3-inch pipe will be employed. The spring being located about 108 meters above the level of the town provides enough pressure for fire protection. One

Abo springs, source of supply for Nagcarlan Waterworks, Laguna, P. I.

fire stream of 150 gallons per minute will be available at any hydrant within the town. It is estimated that the system will cost about ₱40,000.

The Lucena–Tayabas waterworks, Tayabas, was fully described in the bureau report for last year. A small additional amount was allotted this year to complete the distribution system in the municipality of Tayabas.

The Santa Cruz water system, Marinduque, Tayabas, is a gravity system to supply water to the municipality for domestic use only. The source is a stream of water fed by mountain springs. A 3-inch G. I. pipe line 1,500 meters long conveys the water to the town where 1-inch G. I. pipe is used for distribution. The system cost about ₱20,000.

The San Antonio water system, Zambales, is estimated to cost ₱71,000. The source of supply is a mountain creek at an elevation of 60 meters above the town. The water flows by gravity through a 5-inch riveted steel pipe line into a 117,000 gallons reservoir and thence through 3-inch and 1-inch G.I. pipes through the town. One fire stream of 120 gallons per minute is provided in this system.

CONVERSION TABLE.

One peso (₱)	=50 cents, United States currency.
One kilometer (km.)	=0.62 miles.
One kilogram (kg.)	=2.20 pounds (lbs.)
One centimeter (cm.)	=0.39 inches.
One meter (m.)	=3.28 feet.
One hectare	=2.47 acres.
One cubic meter (cu. m.)	=1.31 cubic yards.
One hectare meter per day	=8.107 acre feet per day.
One liter per second (second liter)	=0.0353 cubic feet per second (cu. sec.) second feet.

Testing Pagsanjan Waterworks System to 140 pounds pressure, Laguna Province.

FINANCIAL

LOANS FOR ROADS, BRIDGES, SCHOOLS, MARKETS, MUNICIPAL, AND PROVINCIAL BUILDINGS, WATERWORKS, ETC., FROM APRIL 1, 1919, TO JUNE 30, 1919.

Provinces and projects.	Act Nos.		Total.
	1729	1749	
Cavite:			
Silang Market	₱2,000		₱2,000
Indang Market	6,000		6,000
Malabon Primary School Building	4,500		4,500
Capiz: Capiz School Building		₱20,000	20,000
Ilocos Sur: Narvacan School Building		12,000	12,000
Iloilo:			
Dumangas Market	25,000		25,000
Iloilo Normal School		75,000	75,000
Leyte: Leyte Provincial Building	100,000		100,000
Mindoro: Naujan Presidencia	12,000		12,000
Occidental Negros: Cadiz Market	21,000		21,000
Sorsogon: Gubat Market		15,000	15,000
Surigao: Surigao Central School		20,000	20,000
Total	170,500	142,000	312,500

Cavite.—For the purpose of completing the construction of a modern market building, an additional loan of ₱2,000 is hereby granted the municipality of Silang, Province of Cavite, payable in two equal installments, due in nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of completing the construction of a modern market building, a loan of ₱6,000 is hereby granted the municipality of Indang, Cavite, payable in two equal installments due in nine and

Irrigated rice terraces, Subprovince of Ifugao.

ten years respectively, from the date of the loan, together with interest payable quarterly, at the rate of 4 per centum per annum.

For the purpose of constructing additional rooms to the building now used as primary school, a loan of ₱4,500 is hereby granted the municipality of Malabon, Province of Cavite, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

Capiz.—For the purpose of assisting in the completion of a school building in the municipality of Capiz, Province of Capiz, a loan of ₱20,000 is hereby granted that municipality, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date the loan is released, together with interest, payable quarterly, at the rate of 4 per centum per annum.

Ilocos Sur.—For the purpose of constructing a school building in the municipality of Narvacan, Province of Ilocos Sur, a loan of ₱12,000 is hereby granted that municipality, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

Iloilo.—For the purpose of assisting in the construction of a modern market building in the municipality of Dumangas, Province of Iloilo, a loan of ₱25,000 is hereby granted that municipality, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of assisting in the establishment of an Insular Normal School in the province, of Iloilo, a loan of ₱75,000 is hereby granted that province, payable ₱10,500 in four years and six equal annual installments of ₱10,750 each, due in five, six, seven, eight, nine and ten years respectievly, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

Leyte.—For the purpose of completing the construction of a modern provincial building, a loan of ₱100,000 is hereby granted the Province of Leyte, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest payable quarterly, at the rate of 4 per centum per annum.

Mindoro.—For the purpose of constructing a presidencia building in the municipality of Naujan, Province of Mindoro, a loan of ₱12,000 is hereby granted that municipality, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

Occidental Negros.—For the purpose of assisting in the construction of a modern market building in the municipality of Cadiz, Province of Occidental Negros, a loan of ₱21,000 is hereby granted that municipality, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

Sorsogon.—For the purpose of assisting in the completion of modern market building in the municipality of Gubat, Province of Sorsogon, a loan of ₱15,000 is hereby granted that municipality, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date the loan is released, together with intrest thereon, payable quarterly, at the rate of 4 per centum per annum.

Surigao.—For the purpose of constructing a central school building in the municipality of Surigao, Province of Surigao, a loan of ₱20,000 is hereby granted that municipality, payable in ten equal annual installments, due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

Pipe line, Nagcarlan Waterworks. Note high rice paddies, Laguna, P. I.

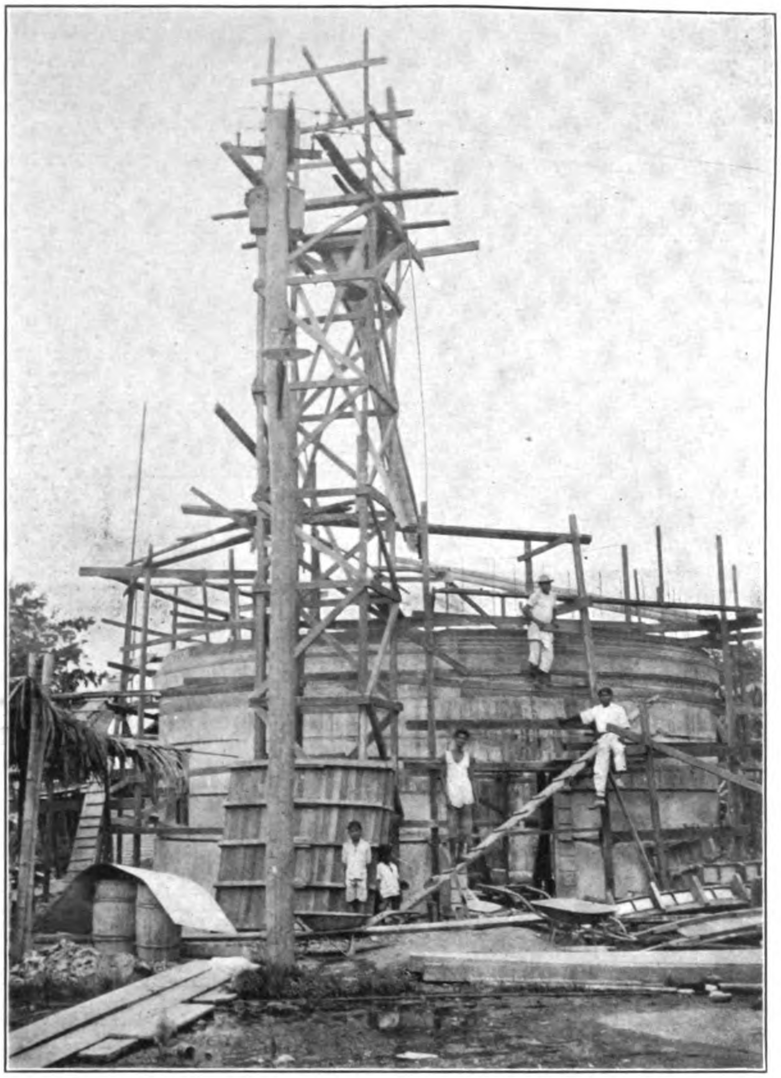
LOANS FOR ROADS, BRIDGES, SCHOOLS, MARKETS, MUNICIPAL, AND PROVINCIAL BUILDINGS, WATERWORKS, ETC., FROM JULY 1, 1919 TO SEPTEMBER 30, 1919.

Provinces and projects.	Act Numbered—		Total.
	1729	1749	
Capiz:			
Capiz high school building		₱50,000	₱50,000
Pontevedra	₱5,000		5,000
Leyte:			
Palo presidencia		16,000	16,000
Provincial building		50,000	50,000
Oriental Negros:			
Provincial high school building		50,000	50,000
Pampanga:			
Mabalacat municipal building		6,000	6,000
Rizal:			
Caloocan school building	35,000		35,000
Total	40,000	172,000	212,000

CAPIZ.—For the purpose of constructing a high school building in the Province of Capiz, a loan of ₱50,000 is hereby granted that province, payable in nine equal annual installments due in two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum.

For the purpose of completing the construction of a school building in the municipality of Pontevedra, Province of Capiz, a loan of ₱5,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years, respectively, from the date the loan is released, together with interest thereon, payable quarterly at the rate of 4 per centum per annum.

LEYTE.—For the purpose of completing a presidencia building in the municipality of Palo, Province of Leyte, a loan of ₱16,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years, respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.



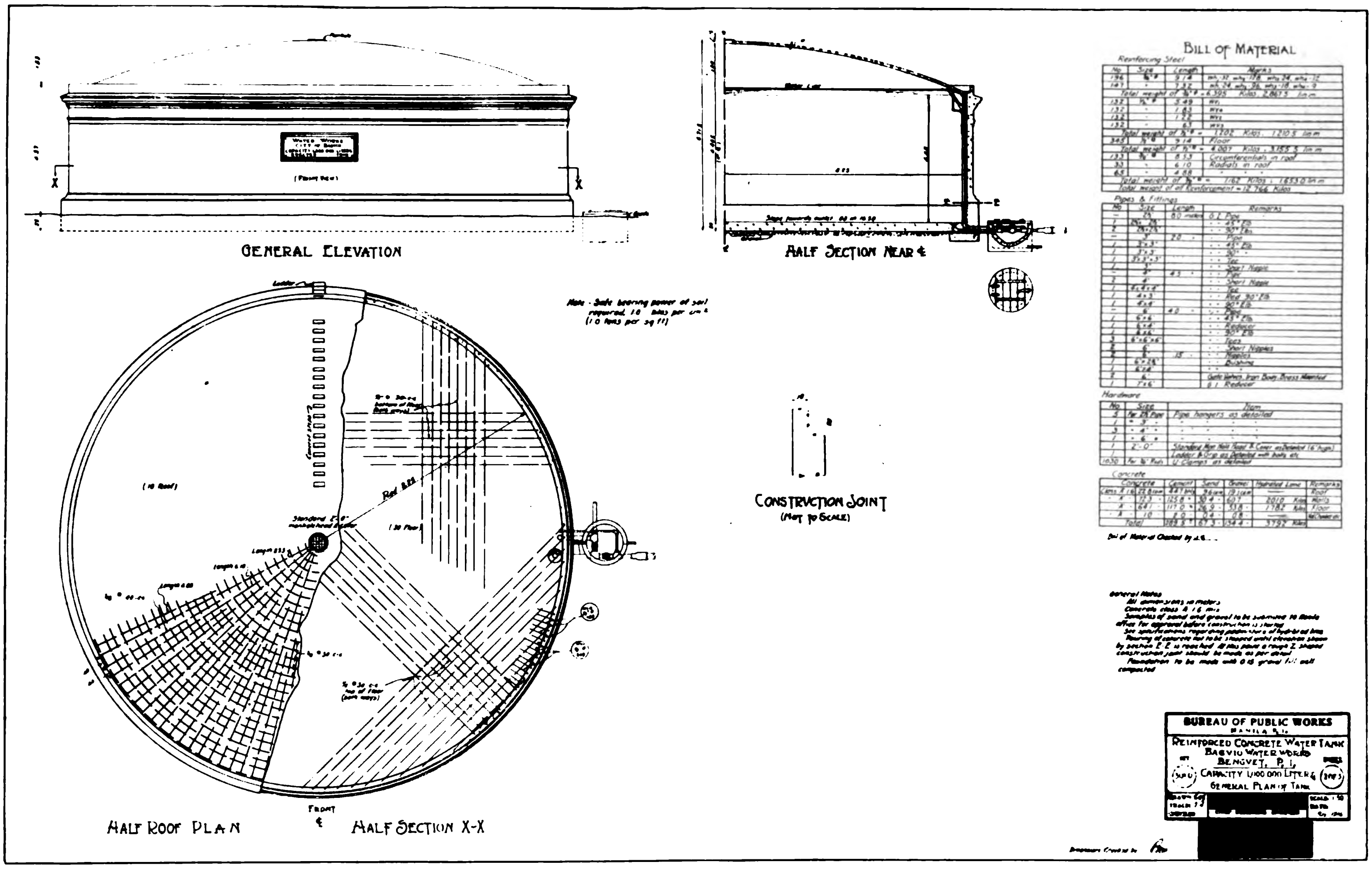
Santa Cruz Waterworks. Tank under construction, Laguna, P. I.

LOANS FOR ROADS, BRIDGES, SCHOOLS, MARKETS, MUNICIPAL, AND PROVINCIAL BUILDINGS, WATERWORKS, ETC., FROM OCTOBER 1, 1919 TO DECEMBER 31, 1919.

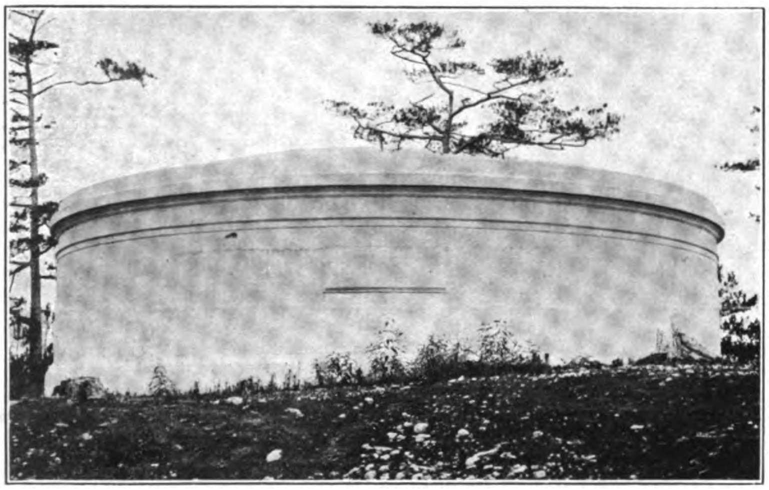
Provinces and projects.	Act Numbered—		Total.
	1729	1749	
Bataan: Balañga intermediate school	₱25,000		₱25,000
Bulacan: Calumpit school building	10,000		10,000
Bohol: Tagbilaran market	2,000		2,000
Ilocos Norte: Paoay school building	10,000		10,000
Nueva Ecija: Cabanatuan market		₱12,000	12,000
Pangasinan: Asingan market	25,000		25,000
Rizal:			
Pasig market		80,000	80,000
Tanay school building	6,000		6,000
Pateros school building	4,000		4,000
Sorsogon: Sorsogon trade school		20,000	20,000
Tayabas:			
Lucena dormitory school for girls		65,000	65,000
Unisan school building	10,000		10,000
Total	92,000	177,000	269,000

For the purpose of completing the new provincial building in the Province of Leyte, an additional loan of ₱50,000 is hereby granted that province, payable in eight equal annual installments due in three, four, five, six, seven, eight, nine, and ten years, respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

ORIENTAL NEGROS.—For the purpose of constructing a provincial high school building in the Province of Oriental Negros, a loan of ₱50,000 is hereby granted that province, payable in ten equal annual

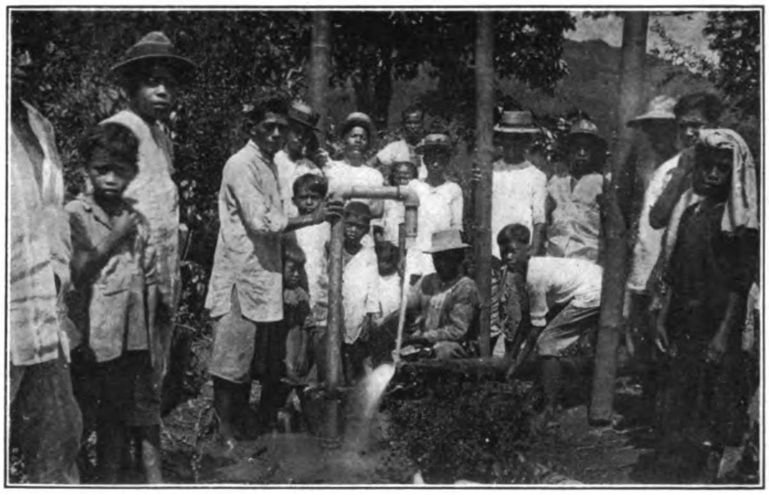


Reinforced concrete water tank, Baguio, Benguet, P. I.



BAGUIO 1,000,000-LITER CONCRETE TANK.

The tank is of a reinforced concrete, 16.50 by 4.50 meters interior diameter and height respectively. The tank site has an elevation 95 meters higher than that of Baguio City Hall which is 1,445 meters above sea level. The water is supplied by pump.



Goose-neck pipe, Santa Cruz Waterworks, Marinduque Island, Tayabas Province.

installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

PAMPANGA.—For the purpose of completing the construction of a municipal building in the municipality of Mabalacat, Province of Pampanga, a loan of ₱6,000 is hereby granted that municipality, payable in six equal annual installments due in one, two, three, four, five, and six years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

RIZAL.—For the purpose of constructing a school building in the municipality of Caloocan, Province of Rizal, a loan of ₱35,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

BALAÑGA.—For the purpose of assisting in the construction of an intermediate school building in the municipality of Balañga, Province of Bataan, a loan of ₱25,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

BULACAN.—For the purpose of assisting in the completion of a school building in the municipality of Calumpit, Province of Bulacan, an addtional loan of ₱10,000 is hereby granted that municipality, payable in nine equal annual installments due in two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

BOHOL.—For the purpose of assisting in the construction of a modern market building in the municipality of Tagbilaran, Province of Bohol, an additional loan of ₱2,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

ILOCOS NORTE.—For the purpose of assisting in the completion of a school building in the municipality of Paoay, Province of Ilocos Norte, a loan of ₱10,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

NUEVA ECIJA.—For the purpose of constructing additional market building in the municipality of Cabanatuan, Province of Nueva Ecija, a loan of ₱12,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years, respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

PANGASINAN.—For the purpose of purchasing a site and erecting a modern market building, a loan of ₱25,000 is hereby granted the municipality of Asingan, Province of Pangasinan, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

RIZAL.—For the purpose of purchasing an addition to the present market site and erecting modern market buildings, a loan of ₱80,000 is hereby granted the municipality of Pasig, Province of Rizal, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of constructing a school building in the municipality of Tanay, Province of Rizal, a loan of ₱6,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of constructing a modern school building in the municipality of Pateros, Province of Rizal, a loan of ₱4,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

SORSOGON.—For the purpose of constructing a Trade School Building a loan of ₱20,000 from the Insular Government is hereby granted the Province of Sorsogon, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

TAYABAS.—The letter of this office dated August 30, 1919, granted a loan of ₱65,000 to the municipality of Lucena, Province of Tayabas, for the purpose of constructing a dormitory building for girls in connection with the high school at Lucena, is hereby amended to read as follows:

"For the purpose of constructing a dormitory building for girls in connection with the high school at Lucena, Tayabas, a loan of ₱65,000 is hereby granted the Province of Tayabas, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum."

For the purpose of assisting in the completion of a school building in the municipality of Unisan, Province of Tayabas, a loan of ₱10,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years respectively, from the date the loan is released, together with interest thereon, payable quarterly at the rate of 4 per centum per annum.

APPENDIX A.

CIRCULAR LETTERS ISSUED BY THE CONSTRUCTING DIVISION, FROM APRIL 1, 1919, TO DEC. 31, 1919.

MANILA, P. I., *June 28, 1919.*

Constructing Division Memorandum No. 22.

SIR: The attention of this office has been drawn to the frequent and often unwarranted visits to Manila of some district engineers and others of the field organization of this Bureau, which, in a number of instances have caused no little inconvenience in the administration of the affairs of the Bureau. On more than one occasion the undersigned, and sometimes the members of the central office station, have been greatly disappointed in not being able to make connection with some district engineers in their districts, in spite of advanced telegraphic notices sent to them to inform them of the impending visit, because the latter had gone out of their districts without notifying the central office previous to leaving their headquarters.

With a view to avoid, in the future, any repetition of such occurrences as mentioned above, it is hereby directed that hereafter district engineers and engineers assigned to special duty desiring to come to Manila or to go outside of their districts for more than half a day, whether on official or private business, must secure authorization to do so from the Director of Public Works, in advance of their departure from their designated headquarters. The nature of the business must be stated clearly. Such telegraphic notice as this, "Leaving for Manila this morning" will not receive consideration. In case of emergency, however, any simple notice to the central office with a statement of the nature of the case will be sufficient.

Very respectfully,

JOSÉ PAEZ,
Director of Public Works.

MANILA, P. I., *July 17, 1919.*

Constructing Division Memorandum No. 23.

SIR: Referring to the submission of progress report for public works in your district, you are hereby advised that a quarterly report will be required hereafter instead of the usual monthly report, as has been done heretofore.

All orders and instructions inconsistent herewith are hereby revoked.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

To all District Engineers,
Supervising Engineers,
Mr. Sotero Baluyot,
Mr. Domingo Guanio, and
Mr. Quirico Camus.

MANILA, P. I., *September 4, 1919.*

Constructing Division Memorandum No. 24.

ARTESIAN WELLS.

SIR: I have the honor to invite your attention to the attached copy of Provincial Circular No. 169, dated August 27, 1919, of the Executive Bureau, transmitting model forms of resolutions which, in order to secure uniformity and promptness in handling matters, should invariably be followed by provincial boards and municipal councils when requesting this Bureau to drill wells.

District engineers, supervising well drillers, and district superintendent of artesian wells should acquaint themselves with these forms of resolutions, and in the future the district engineer ordering the drilling of wells not covered by said resolution will do so at his own risk and personal responsibility.

Very respectfully,

JOSÉ PAEZ,
Director of Public Works.

To all District Engineers,
Supervising Well Drillers,
District Superintendent of Artesian Wells,
Superintendent of Artesian Wells, and
Mr. Quirico Camus.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF THE INTERIOR.

MANILA, *August 27, 1919.*

Provincial Circular No. 169.

ARTESIAN WELLS.

With a view to securing uniformity in the preparation of resolutions acceptable to the Bureau of Public Works in connection with the drilling of artesian wells in provinces and municipalities, and to avoid delay caused by the return of the resolutions for correction, the attached models of provincial board and municipal council resolutions, together with the necessary indorsements to be attached thereon upon forwarding the papers, are hereby prescribed in connection with Provincial Circular No. 166 of this office.

Provincial treasurers will please transmit the contents of this circular to the municipalities.

(Sgd.) A. DE LAS ALAS,
Acting Chief, Executive Bureau.

To all Provincial Boards and
Provincial Treasurers.

THE PROVINCIAL GOVERNMENT OF..............................
.............................., P. I.

Excerpt from the minutes of the regular meeting held by the Provincial Board of .... at ....
.... on .... of .... 19........

Present:
Hon.. Provincial Governor.
Mr.. Member.
Mr.. Member.
Absent.

RESOLUTION No. ....

On motion of ...., the following resolution was submitted:

Resolved, that the Director of Public Works is hereby requested to undertake the drilling of (number) .... wells in this province, for the municipalities of ...., ..., ...

Resolved, that in accordance with the instructions contained in the Provincial Circular No. 166, dated September 10, 1918, of the Chief, Executive Bureau, concurred in by the Director of Public Works, this Board guarantees the reimbursement to the Bureau of Public Works of the one-third cost of all authorized and successfull wells to be drilled in the province.

Resolved, that this resolution covers the drilling of all such wells until they are completed.

Resolved further, that the Secretary to the Board is hereby directed to forward certified copies of this resolution, through the provincial treasurer, to the district engineer for their respective action in accordance with the above-mentioned circular of the Chief Executive Bureau.

Carried.

I hereby certify to the correctness of the above-quoted resolution.

....
Secretary, Provincial Board.

PROVINCIAL GOVERNMENT OF ....

OFFICE OF THE TREASURER.

1st Indorsement.

(Date) ....

Respectfully forwarded to the Director of Public Works through the district engineer, ... certifying that there are funds available for the expenditure contemplated in the foregoing resolution.

....

Provincial Treasurer.

OFFICE OF THE DISTRICT ENGINEER.

.................................., ...

2nd Indorsement.

(Date) ....

Respectfully forwarded to the Director of Public Works, Manila, recommending favorable action.

....

District Engineer.

THE MUNICIPAL GOVERNMENT OF..

...., P. I.

Extract from the minutes of the regular session held by the municipal council of .... on the .... day of ...., 19.........

Present:

....	President.	....	Member.
....	Member.	....	Member.
....	Member.	....	Member.
....	Member.	....	Member.
....	Member.	....	Member.

RESOLUTION No. ....

In conformity with Provincial Circular No. 166 of the Executive Bureau, dated September 10, 1918, and upon motion of member ...., seconded by member ....

Be it resolved, That this council by means of this resolution authorizes the provincial board to request the Bureau of Public Works to drill .... wells in this municipality, each well location to be authorized by the municipal council and approved by the district engineer.

Resolved further, That the provincial treasurer be and hereby is authorized to deduct from the revenues of this municipality a sufficient amount to pay the one-third (⅓) cost of all duly authorized successful wells drilled in this municipality; and,

Resolved further, That certified copies of this resolution be forwarded to the provincial board through the provincial treasurer for their respective action and approval.

Unanimously approved.

I hereby certify to the correctness of the above-quoted resolution.

....

Municipal Secretary.

PROVINCIAL GOVERNMENT OF.................................

OFFICE OF THE TREASURER.

1st Indorsement.

Respectfully forwarded to the honorable provincial board, ..., certifying that there are funds available for the expenditure contemplated in the above Resolution No. ...., current series, of the municipal council of ...., ..., and recommending of approval.

....

Provincial Treasurer.

PROVINCIAL GOVERNMENT OF ....

...., P. I.

Excerpt from the minutes of regular session held by the provincial board of .... at ...., ... on .... day of ...., 19.........

Present:

....	Provincial Governor.
....	Member.
....	Member.

Absent:

....

RESOLUTION No. ....

On motion of ...., the following resolution was submitted:

Resolved, That the above Resolution No. ...., current series, of the municipal council of ...., be approved.

Resolved further, That this resolution be forwarded through the provincial treasurer to the district engineer requesting that the drilling of .... wells in the municipality of ...., ..., be undertaken as soon as practicable.

Carried.

I hereby certify to the correctness of the above-quoted resolution.

....

Secretary, Provincial Board.

PROVINCIAL GOVERNMENT OF...

OFFICE OF THE TREASURER.

1st Indorsement.

Respectfully forwarded to the district engineer, ..., noting the approval contained in the foregoing resolution of the honorable provincial board of .... or Resolution No. ...., current series, of the municipal council of ...., ..., P. I.

....

Provincial Treasurer.

MANILA, *September 15, 1919.*

Constructing Division Memorandum No. 25.

Subject: **TELEGRAMS.**

Sir: Information has been received from the Insular Purchasing Agent to the effect that his Bureau is not familiar with the names of a number of district engineers, and consequently when telegrams received from them are signed with their names they were often mistaken and treated as matters originating from private parties. It is, therefore, hereby directed that in the future, all telegrams addressed by district engineers to the Insular Purchasing Agent, be signed "District Engineer."

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

To all District Engineers,
Supervising Engineers, and
Mr. Quirico Camus, Traveling
Inspector, Bureau of Public Works.

MANILA, *November 28, 1919.*

Constructing Division Memorandum No. 26.

Subject: **APPOINTMENTS.**

SIR: It has been observed in the past that a number of appointments received from district offices were antedated and had to be returned to the district engineers forwarding same for explanation and correction. If the date of the appointment, the effective date of same and that of the letter of submittal do not agree, or if the date of the appointment and the date of the letter of submittal appear to be later than the effective date of the appointment, these details are considered by the Bureau of Civil Service as contrary to Sec. 256 of the Revised Administrative Code, which, in part, provides as follows:

"* * * an appointment or promotion shall not be effective as of a date prior to that upon which the appointment or promotion is actually made."

Therefore, in order to comply with the rules and regulatinos of the Bureau of Civil Service, and to avoid unnecessary correspondence and consequent delays in coursing future appointments, it is hereby directed that hereafter appointments be so prepared that the date thereof will agree with the effective date of same and with the date of the letter of submittal; or the date of the appointment and the accompanying letter of submittal will not be later than the effective date of the appointment.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
and Mr. QUIRICO CAMUS.

MANILA, *November 29, 1919.*

Constructing Division Memorandum No. 27.

Subject: MARKET.

SIR: With a view towards reducing to a minimum, if not eliminating entirely, such mistakes as have been committed heretofore in connection with market constructions, such as forwarding requisitions for materials before the project is duly authorized, or before the site is surveyed and the plan submitted for preliminary planning for the market and tiendas to be built, etc., the following instructions are hereby given for the benefit of those district engineers who are not as yet well informed as to the proper steps to take in this matter:

1. The Chief, Executive Bureau or the Secretary to the Governor-General, will request the district engineer to prepare a plan of the market site selected by the municipal council concerned.

2. The district engineer will draw the plan of the market site to the scale of 1:500 and will show thereon the following items:

(*a*) All bearings and true lengths of boundary lines;
(*b*) Elevations of each and every corner;
(*c*) All corners to be numbered;
(*d*) Contours of ground, every 0.25 m. of elevation, if practical;
(*e*) The present name and width of streets at all boundaries;
(*f*) Location of proposed streets (if any);
(*g*) All buildings located on the site with an approximate estimate of the cost of removing and reconstructing same;
(*h*) The approximate boundaries and the separate areas of the different parcels within the site;
(*i*) The name of each owner;
(*j*) The area of the entire site;
(*k*) Source of water supply (if any); and
(*l*) Points to which water will drain.

3. As soon as the site plan is completed and approved three blue-print copies should be secured.

4. Two of these blue-print copies should be sent to the Chief, Executive Bureau, Manila.

5. In the meantime the Municipal Council should pass a resolution authorizing the Director of Public Works to prepare preliminary plans for the market and tiendas to be built. This resolution should be sent through the office of the Chief, Executive Bureau, to this office, and must be accompanied by a certificate of the provincial treasurer as to the amount of funds available.

6. Upon receipt of the necessary authority from the Chief, Executive Bureau, the Bureau of Public Works will prepare various schemes and plans of different sizes and types of markets and tiendas to suit the amount of funds available, and will forward these to the Chief, Executive Bureau, together with approximate estimates of cost of each.

7. The Chief, Executive Bureau, will then forward his recommendation to the municipal council as to the scheme and plans to be adopted.

8. The municipal council will then pass a resolution approving the scheme and plans recommended by the Chief, Executive Bureau, and authorizing the Director of Public Works to prepare final plans and specifications, to advertise for bids for the construction of the market or tiendas selected, and to accept or reject any or all bids, or to proceed with the work by administration. (According to the Administrative Code, no building that will cost ₱3,000.00 or more should be constructed without first advertising for ten consecutive days both locally and in Manila. Also, no building that will cost ₱3,000.00 or more should be built without the approval of the Consulting Architect as to type, location, etc.)

9. This resolution will then be forwarded to the Chief, Executive Bureau, Manila, for authority to prepare final plan, and specifications and to advertise the project.

10. A certain date will be fixed for opening bids and while the project is being advertised in Manila, the district engineer will be requested to advertise same locally, and to prepare an estimate of cost which should be received by the Bureau of Public Works in Manila on or before the date of opening bids.

11. The district engineer wil then be duly notified as to whether the project will be done by contract or by administration.

12. The district engineers should never proceed to construct any market, tienda, or, in fact, any building, nor to requisition materials, without due authority from the Director of Public Works.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
and Mr. QUIRICO CAMUS.

MANILA, *December 8, 1919.*

Constructing Division Memorandum No. 28.

Subject: TELEGRAM.

SIR: Attention is invited to the following excerpt of a letter sent by the Constructing Division in the year 1916 to all District Engineers, Supervising Engineers, and Engineers on special duty:

Telegraphic communication is to be used sparingly, and only where urgently necessary.

"In provinces where letter mail can reach Manila in one day or vice versa, telegrams will not be used, except in cases of vital importance. For the Director. (Signed) D. E. HENRY, *Acting Chief Constructing Engineer.*"

The above-mentioned letter was intended to regulate the use of telegraphic means of communications, and it is herein-above quoted, and made a part of this memorandum, to remind all the engineers in the provinces of the existence of such a regulation, and to request the continuance of strict observance of same.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

To all DISTRICT ENGINEERS,
SUPERVISING ENGINEERS,
ENGINEERS ON SPECIAL DUTY,
and Mr. QUIRICO CAMUS.

APPENDIX B.

PROJECTS ACTIVE JULY 1, 1919

Province.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	3	3						1												2											2		2	13
Agusan	5	5																		2						1					1		7	21
Albay	8	4		1						1			1							2		1		1				1					2	22
Ambos Camarines	5	10	1			1	1			1			4							5	1			1		1							4	35
Antique	6	2																		1														9
Bataan	7	4			2		1				1									1		1				2							2	21
Batangas	6	3	2							1									1	4	1			4	2	1		4					13	42
Benguet	1	6								1			1							1	1					9							10	30
Bohol	6	3		1	4												1			7					1	2		5					2	32
Bukidnon	4	1															1			1						1		1			1			10
Bulacan	6	3		2	2															5								1					3	22
Cagayan	3	2											1							1							1						10	18
Capiz	12	2			4								1							4							1						1	25
Cavite	3	2			2															4				3				1					6	21
Cebu	9	2			2															4		1		4	2	4		11					19	58
Cotabato	9	3		1	2															3				2	1		1				2		7	31
Davao	6	3			1												1			1				1	2	5	1	1			2		9	33
Ilocos Norte	3	2							1											6		1											2	15
Ilocos Sur	9	2														1		1		2						2	1						3	21
Iloilo	11	3	2		2																				1	3		1			1		8	32
Isabela	4	2							1				2							6													4	19
La Laguna	6	2	1					1	1				2		1					6		1		2		2		6					3	34
Lanao	4	3		1		1														3				1							1		4	18
La Union	3	4																		8				3	1								1	20
Leyte	5	2							1		1		4					1		1		1		3	1						1		4	25
Mindoro	3	3		1						1			1							6	1							2					1	19
Misamis	5	3		1	1														1									3					3	17
Mountain Province	7	10			2								7							4		1		1		2					1	1	17	53
Nueva Ecija	9	2											1							6													10	28
Nueva Vizcaya	4	4		1																4		2									1		1	17
Occidental Negros	12	2			2																						1						1	18
Oriental Negros	4	5								1			1							2								2					3	18
Pampanga	7	7			1								1							9													2	27
Pangasinan	13	3		1	6				1				3							3		1	1	3								1		36
Rizal	5	4		1	1															2				1							1			15
Romblon	3	1								1										1													1	7
Samar	3	3																		3				1			1						5	16
Sorsogon	8	3			2			1					1				1			1		1		1				1					3	23
Sulu	2	2																		5				1	1	1		1			2		7	22
Surigao	1	2																		3								3					2	11
Tarlac	6	3											2		1	1				1													1	15
Tayabas	10	4																		3				2	2	2		4					10	37
Zambales	5	3																		2											1			11
Zamboanga	5	4																		5				1	2	1							6	24
Total	256	146	6	11	36	2	2	3	5	7	2		33		2	2	4	2	2	140	4	11	1	36	16	39	7	48			17	2	199	1,041

NOTE.—Of the 199 projects under the caption "Miscellaneous," there are 20 surveys and investigations of roads, bridges, water supply, irrigation systems, hydraulics, hydrographies, etc., 13 wharves, 12 irrigation systems, 18 hospital buildings, 2 boundary monuments, 4 docks, 42 artesian wells, 7 port works maintenance, 3 maintenance harbors, 4 river controls, 4 customhouses, 2 dredgings, 1 dyke, 21 constabulary buildings, 3 water tanks, 1 pier, etc.

APPENDIX C.

PROJECTS ACTIVE OCTOBER 1, 1919.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	3	3						1												2											2		3	14
Agusan	5	5																		3				1		1					1		7	23
Albay	6	4		1	1					1			1		1					1		1		1				1					3	22
Ambos Camarines	4	9	1			1	1			1			4							6	1			3		1							5	37
Antique	6	2								1										1								1						11
Bataan	5	4			1						1									2		1				2							2	18
Batangas	6	3	2	1						1									1	8			2	5	2	1		5					15	52
Benguet	10	2						1			1													2	2	4		2			1	1	4	30
Bohol	7	3		2	4							1					1			7				1	1	2		5					2	36
Bukidnon	3	2															1			1						1		1			1			10
Bulacan	5	3		3	2															5								1					4	23
Cagayan	3	2											1							3							1						7	17
Capiz	11	3			5								1							6													1	27
Cavite	3	2			2															4				3				2					2	18
Cebu	1	2		10	3										1					6			2	4	1	7		12					22	71
Cotabato	9	3		1	2															3				2			1				2		12	35
Davao	6	3			1					1			1				1			2				1	2	3	1	1			2		11	36
Ilocos Norte	4	2							1											6		2											2	17
Ilocos Sur	7	4														1		1		2						3	1						3	20
Iloilo	16	3			2															2					1	5					1		5	35
Isabela	4	2							1				2							7													4	20
La Laguna	5	2	1					1	1				2		1					8				2		1		6					1	31
Lanao	4	3		1		1					1									4				1							2		5	22
La Union	5	4									1									8				3									2	23
Leyte	5	2							1		1		4					1		3		1		3							1		3	25
Mindoro	2	3		1						1			1							4	1							3					2	18
Misamis	6	3			1																							3					2	15
Mt. Province	8	11			3						1		7							5				2		4					1	1	17	60
Nueva Ecija	9	2											1							6													13	31
Nueva Vizcaya	4	4		1																4		2									1		1	17
Occ. Negros	7	2			1																						1						1	12
Oriental Negros	4	5								1			1							2								2					3	18
Palawan	3	1																						1										5
Pampanga	7	5			1								1							8													2	24
Pangasinan	12	3		1	6				1				2							5		2		4								1		37
Rizal	6	5			1						1									4				1									2	20
Romblon	3	1									1									1		2											3	11
Samar	3	3																		3				1									4	14
Sorsogon	8	3			1			1					1				1			3				1				1					2	22
Sulu	2	2																		5				1	1	1		1			2		8	23
Surigao	1	2																		3								4					2	12
Tarlac	6	3											2		1	1				1						1								15
Tayabas	7	4								1										7				2	2	1		4					11	39
Zambales	6	3			1										1					2											1			14
Zamboanga	5	4																		6				1	2	1						1	8	28
Total	252	146	4	22	38	2	1	4	5	8	8	1	32	0	5	2	4	2	1	169	2	11	4	46	14	37	5	55	0	0	18	4	206	1,108

NOTE.—Of the 206 projects under the caption "Miscellaneous," there are 11 surveys and investigations of roads, bridges, irrigation systems, water rights, etc., 6 docks, 49 artesian wells, 7 port works maintenance, 1 maintenance harbor, 11 irrigation systems, 12 wharves, 3 river controls, 3 customhouses, 2 dredging projects, 4 dykes, 2 boundary monuments, 25 constabulary buildings, 3 irrigation ditches, 3 water tanks, 18 hospitals, 1 pier, etc.

APPENDIX D.

PROJECTS ACTIVE JANUARY 1, 1920.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	3	3						1												2											2		3	14
Agusan	5	4																		3				1		1					1		7	22
Albay	9	4			1					1	1		2		1					3				2	1	1		1					3	30
Ambos Camarines	4	9	1			1	1			1			4							6	1			2		1							5	36
Antique	7	2								1										3				1				1						15
Bataan	3	2									1									1		1				3							1	12
Batangas	8	5		2						1									1	5	3		2	6	3	1		7				1	15	60
Benguet	13	9						2		1	1		1											2.	4	9		3	2		1	2	10	60
Bohol	6	3		2	4				1		1						1			8				1	1	2		5					3	38
Bukidnon	3	2																		1						1		1			1			9
Bulacan	5	5		3	2															5						1		1					4	26
Cagayan	3	2								1			1							2	2					2	1						9	23
Capiz	10	2		1	5															4							1						1	24
Cavite	3	2			2															4				3		1		2					2	19
Cebu	2	2		9					1						1					5				2	1	4		11					20	58
Cotabato	9	3		1	2															3				2	1		1				3		12	37
Davao	7	3			1								1				1			2				1	2	3	1	1			2		14	39
Ilocos Norte	3	3							1											6		5				1							2	21
Ilocos Sur	8	3														1		1		2						2	1				1		5	24
Iloilo	17	3	1		2															2				1	1	5					1		5	38
Isabela	4	2							1				2							7													4	20
La Laguna	5	2	1					1					2		1					9				2		3			5				1	32
Lanao	4	3		1		1														5				1							2		6	23
La Union	5	4									1									8				4									2	24
Leyte	5	2							1		1		4					1		5		1		2									3	25
Mindoro	2	3		1						1			1							6	1							5			1		2	23
Misamis	5	3		1	1															1				1				3					4	19
Mt. Province	8	11			3						2		7							4		1		2		4		2			2	1	16	63
Nueva Ecija	9	3											1							6													13	32
Nueva Vizcaya	5	4																		4		2									1		2	18
Occ. Negros	11	2																									1						1	15
Or. Negros	5	5		1						1										3								2					4	21
Palawan	4																							1		1		3			3			16
Pampanga	6	6											1							8													2	23
Pangasinan	12	4	1		4				1				2							5			3	5			1							38
Rizal	12	7		2	2						1									7		2		1		1					1		2	38
Romblon	3	1								1										2		2											3	12
Samar	4	3																		3				1									4	15
Sorsogon	8	3			1			1					1				1			2		1		1				1					2	22
Sulu	2	2																		5				1	1	1		1			2		8	23
Surigao	2	2									1									4						1		4					2	16
Tarlac	6	3											3		1					1						1								15
Tayabas	5	4								1										4				1	3			5					11	34
Zambales	6	3			1															2		1				1		1			1			16
Zamboanga	5	4								1										6				1	2	1						1	8	29
Total	271	157	4	24	31	2	1	5	6	11	10	0	33	0	4	1	3	2	1	174	7	16	5	48	20	52	7	65	2	0	25	5	225	1,217

NOTE.—Of the 225 projects under the caption "Miscellaneous," there are 1 port light station, 6 docks, 49 artesian wells, 8 port works maintenance, 2 maintenance harbors, 16 irrigation ditches, 13 wharves, 4 river controls, 2 customhouses, 1 dredging, 4 dykes, 2 boundary monuments, 30 constabulary buildings, 1 irrigation ditch, 20 investigations of roads, bridges, water supply, irrigation systems, hydrographies, etc., 3 water tanks, 18 hospitals, 3 piers, 1 dam, 2 monuments, etc.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1920.]

JOSE PAEZ, ***Director of Public Works***
MARCIAL KASILAG, ***Acting Chief Constructing Engineer***
E. C. EARLE, ***Chief Designing Engineer***
A. D. WILLIAMS, ***Chief Irrigation Engineer***
TOMAS MAPUA, ***Supervising Architect***
JUAN ARELLANO, ***Supervising Architect***

CENTRAL OFFICE ORGANIZATION.

ADMINISTRATIVE DIVISION.

C. A. Tansill, Assistant to the Director.
Rosendo Reinoso, Chief Accountant.
T. Camú, Cashier and Disb. Officer.
Primo Villar, Record Clerk.
Jose de Jesus, Property Clerk.
B. Manipula, Superintendent of Automobiles.

DESIGNING DIVISION.

Julian Vallarta, C. E., Head Checker.
L. L. Vincent, E. & M. E.
C. H. Davidson, C. E.
L. H. Thompson, E. & M. E.
M. C. Collins, C. E.
Teofilo Reyes, C. E.
Juan Piedad, C. E.
Pedro Siochi, C. E.
Jose Wright, Asst. C. E.
Vicente Villanueva, J. E. E.

DIVISION OF ARCHITECTURE

Cheri Mandelbaum, Chief Arch. Draftsman.
Vicente L. Legarda, C. E.
H. Ray Kingsley, Structural Engr.
Gonzalo Vales, C. E.
V. Lavadia, J. C. E.
Carlos Barreto, Supervising Arch. Draftsman.
Antonio Toledo, Supervising Arch. Draftsman.
Juan Altiveros, Arch. Draftsman.
E. V. Felix, Arch. Draftsman.

CONSTRUCTING DIVISION.

N. R. Baugh, C. E.
Sotero Baluyut, C. E.
Domingo Guanio, C. E.
H. H. Houk, C. E.
H. S. Clemente, Assistant C. E.
Manuel Gochuico, Assistant Engr.
A. W. Wolf, Supt. of Artesian Wells.
J. T. Bootes, Supt. of Dredge Construction.
Vicente Castillo, Superintendent of Dredges.
Quirico Camus, Traveling Inspector.

IRRIGATION DIVISION.

G. G. Stroebe, Hydraulic Engineer.
R. H. Shoemaker, Asst. Engineer.
C. H. Gabelman, C. E.
E. Quisumbing, Designing Engineer.
Leon Ines, C. E.
Gonzalo Garcia, C. E.
Manuel Gonzalez, Asst. C. E.
Harry P. Hart, C. E.
B. B. Buchanan, C. E.
E. L. Perez, J. C. E.
Justo Arrastia, J. C. E.
Jose Alario, J. C. E.
Angel Martinez, J. C. E.

DISTRICT ORGANIZATION.

E. J. Halsema, D. E. and S. E., Benguet.
Rosalio Villalon, J. C. E., Benguet.
Manuel Diaz, Acting D. E., Mountain Province.
Leandro Espejo, Acting D. E., La Union.
N. S. Saleeby, D. E., Cagayan.
Rafael Ungson, J. C. E., Cagayan.
Roque Peredo, Acting D. E., Isabela.
Vicente Oledan, Acting D. E., Nueva Vizcaya.
B. F. Mills, D. E. and S. E., Albay.
J. F. Imperial, J. C. E., Albay.
D. Urtula, D. E., Ambos Camarines.
A. Tayzon, D. E., Sorsogon.
J. C. Cookingham, D. E. and S. E., Zamboanga.
W. A. Newton, C. E., Zamboanga.
W. B. Honska, D. E., Lanao.
W. J. Hollis, Acting D. E., Sulu.
Mateo Roco, D. E., Davao.
L. R. Tillet, Acting I. E., Cotabato.
J. Follosco, J. C. E., Cotabato.
R. N. Allen, D. E., Misamis.
M. Operario, J. C. E., Misamis.
M. Angeles, Acting D. E., Bukidnon.
J. Lozada, Acting D. E., Agusan.
Juan Macaraeg, D. E. and S. E., Tayabas.
V. Segura, C. E., Tayabas.
S. Tan Chauco, J. C. E., Tayabas.
R. P. Ticzon, J. C. E., Tayabas.
Jose Ignacio, Acting D. E., Rizal.
Vicente Orosa, D. E., Cavite.
J. V. Bagtas, D. E., Laguna.
J. Laguardia, J. C. E., Laguna.
J. Villanueva, Acting D. E., Batangas.
M. Cruz, Acting D. E., Mindoro.
M. M. Resplandor, J. C. E., Mindoro.
Pastor Avisado, D. E., Palawan.
L. T. Clark, D. E. and S. E., Cebu.
G. Alcantara, J. C. E., Cebu.
A. Osmeña, J. C. E., Cebu.
J. Gandionco, Acting D. E., Or. Negros.
M. Dimson, Acting D. E., Bohol.
S. Lopez, D. E., Leyte.
T. J. Medicielo, C. E., Leyte.
T. Mocorro, J. C. E., Leyte.
R. S. Frush, D. E., Samar.
F. Piczon, J. C. E., Samar.
L. Ortiz, Acting D. E., Surigao.
A. T. Sylvester, D. E. and S. E., Iloilo.
F. P. Reynolds, Asst. Engr., Iloilo.
V. Fragante, D. E., Occ. Negros.
A. Altimerano, J. C. E., Occ. Negros.
A. P. Nitorreda, D. E., Capiz.
J. A. Aldea, Junior Assistant Engr., Capiz.
Rufino Garcia, Acting D. E., Antique.
J. Arquisola, Acting D. E., Romblon.
E. D. Smith, D. E. and S. E., Ilocos Sur.
A. C. Babcock, Asst. Engr., Ilocos Sur.
S. Fernandez, Acting D. E., Ilocos Norte.
Luis Francisco, D. E. and S. E., Pangasinan.
Gustavo Cruz, J. C. E., Pangasinan.
G. J. Militante, Acting D. E., Nueva Ecija.
Isaias Fernando, Assistant C. E., Nueva Ecija.
F. V. Larracas, Acting D. E., Tarlac.
L. Urtizberea, J. C. E., Tarlac.
Manuel Reyes, D. E., Pampanga.
M. A. de Castro, Acting D. E., Zambales.
I. Lagniton, D. E., Bulacan.
M. Arranz, Acting D. E., Bataan.

ON LEAVE.

J. T. Marshall, C. E. (In U. S.)
L. S. Boggess, C. E. (In U. S.)
Alejo Aquino, C. E. (In Manila.)

LEGEND.

S. E. = Supervising Engineer.
C. E. = Civil Engineer.
D. E. = District Engineer.
E. & M. E. = Electrical and Mechanical Engineer.
J. E. E. = Junior Electrical Engineer.
J. C. E. = Junior Civil Engineer.

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THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS ·

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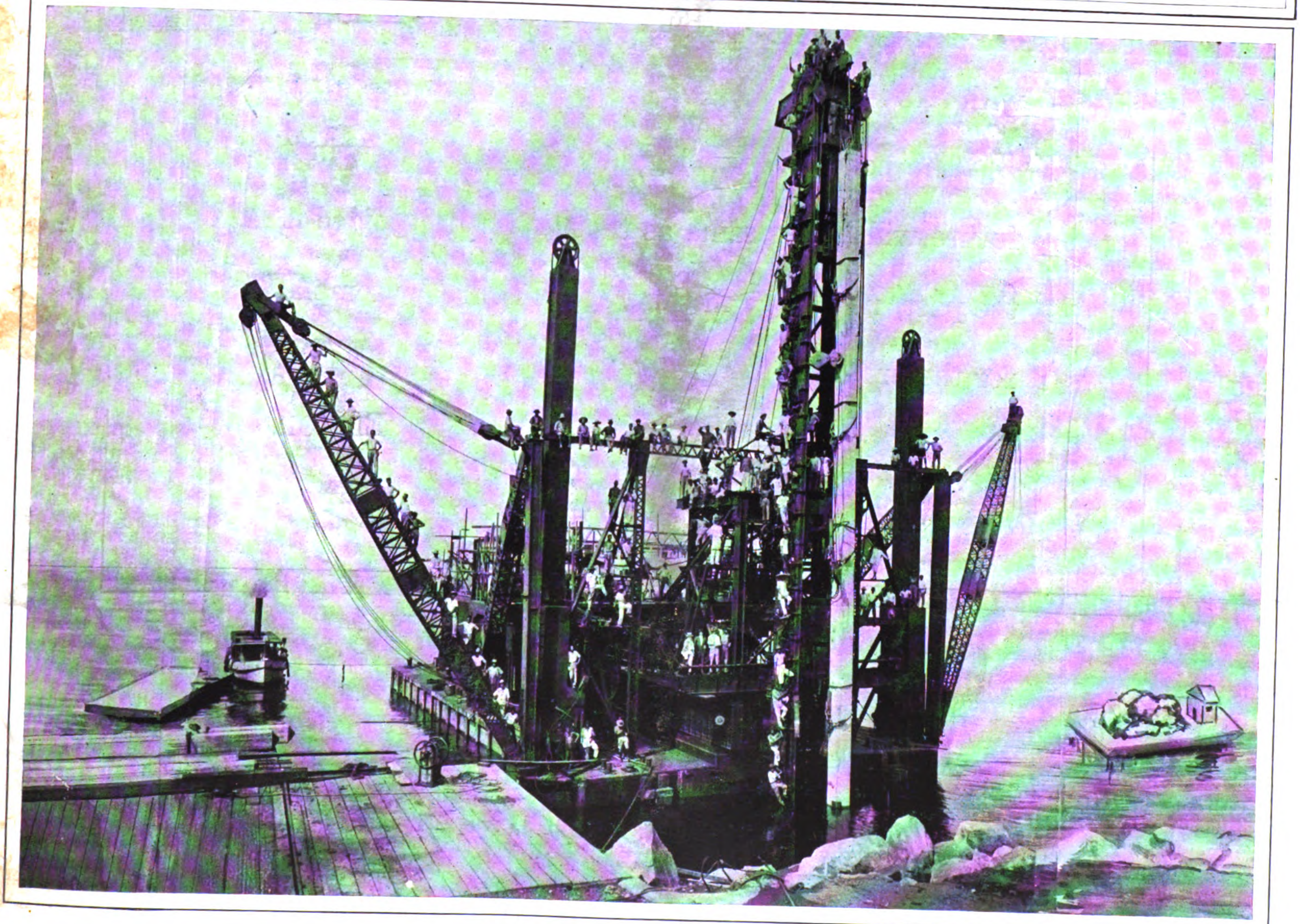
BULLETIN

Vol. 9 JANUARY 1, 1921 No. 1



Bird's-eye View of Pile Driver "Mammoth."

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ANNOUNCEMENT

This publication will in the future be known as "THE BUREAU OF PUBLIC WORKS BULLETIN" instead of "Quarterly Bulletin" as hitherto, beginning with this issue.

The policy that will guide this publication in the future will be the same as that which has guided it in the past, no change in this regard being contemplated for the present.

EDITOR.

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1920

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

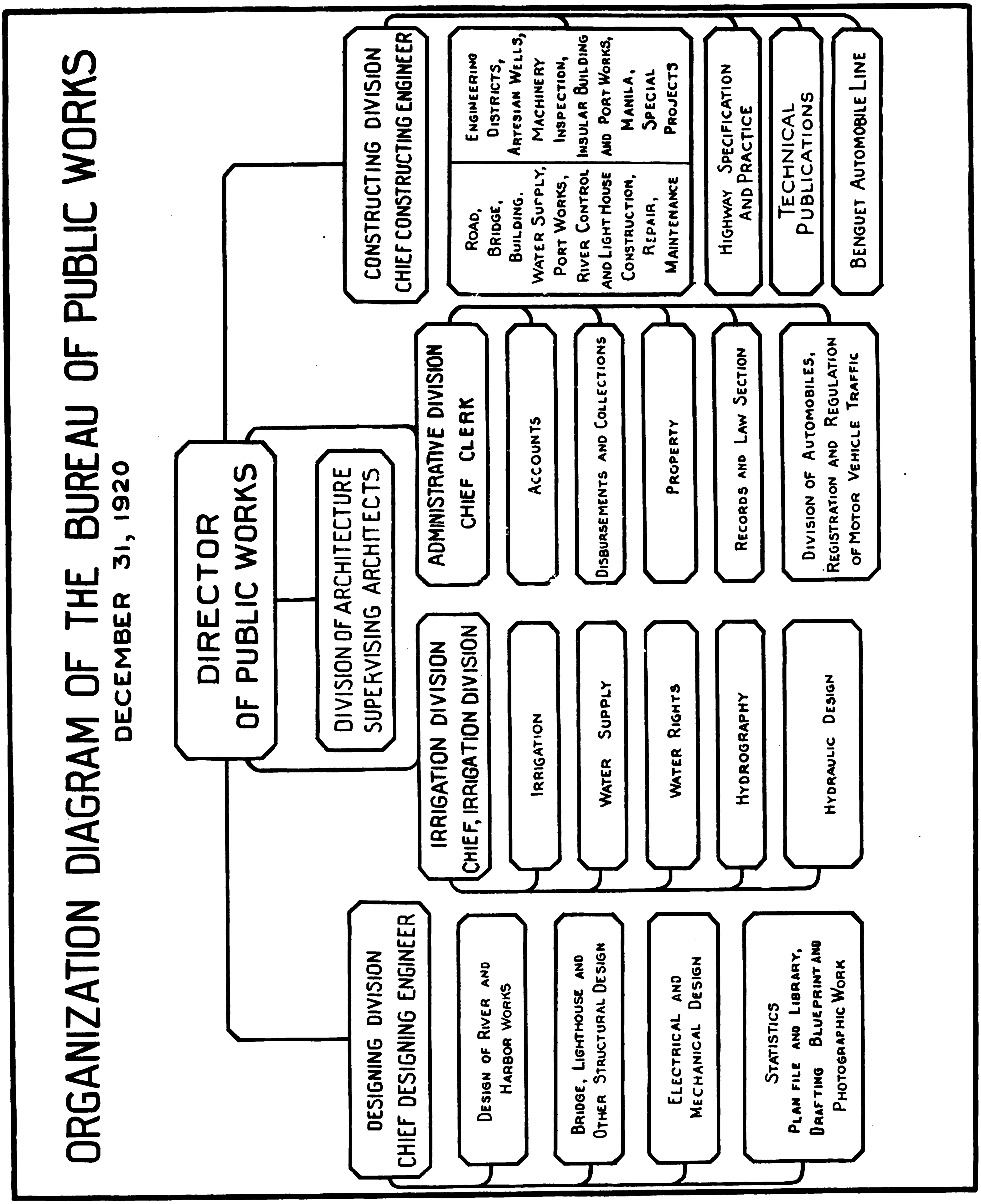
MANILA, P. I., April 6, 1921.

Sir: I have the honor to submit herewith the Report of the Bureau of Public Works for the fiscal year ending December 31, 1920.

Very respectfully,

JOSE PAEZ,
Director of Public Works.

The Honorable,
THE SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.



ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1920

DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS PLAN FILE AND LIBRARY, DRAFTING BLUEPRINT AND PHOTOGRAPHIC WORK
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
ADMINISTRATIVE DIVISION CHIEF CLERK
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING. WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHT HOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
TECHNICAL PUBLICATIONS
BENGUET AUTOMOBILE LINE

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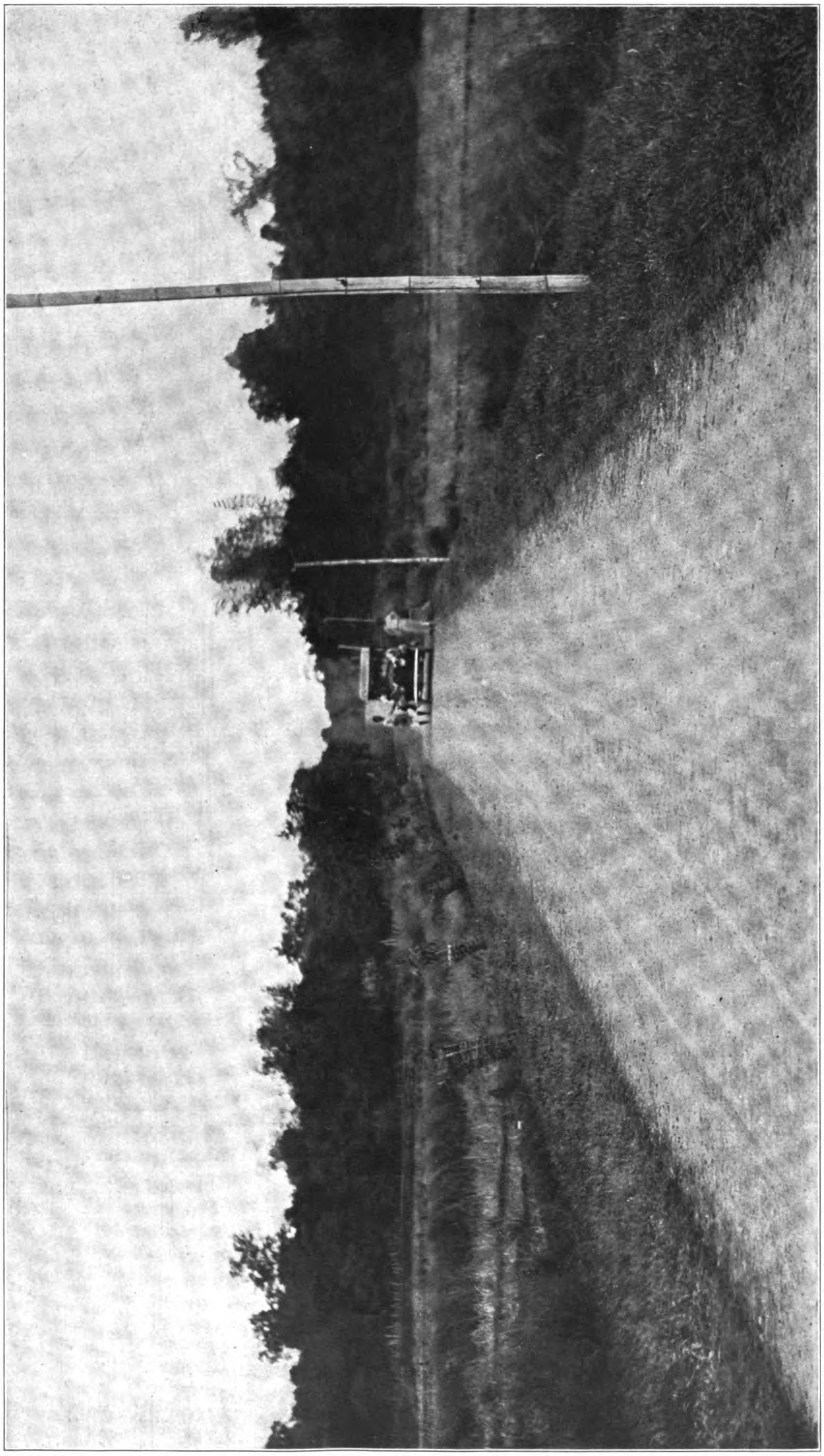


Km. 170, Camiling–Pangasinan Boundary Road, Tarlac Province, P. I.

THE BUREAU OF PUBLIC WORKS BULLETIN

OFFICIAL ORGAN OF THE BUREAU OF PUBLIC WORKS
MANILA, P. I.

PUBLISHED FOUR TIMES A YEAR UNDER THE DIRECTION OF
JOSE PAEZ, *Director of Public Works*

VICENTE L. LEGARDA, EDITOR-IN-CHIEF
G. A. RICO, ASSISTANT EDITOR AND COMPILER

ORGANIZATION AND PERSONNEL.

While the organization of the Bureau of Public Works as a whole suffered no material change during the year, the number of its technical personnel was reduced from 152 to 143, or a loss of nine (9) men. Every effort was made to retain the services of old and experienced technical men, and to secure additional engineers and architects from outside, but only very little success was attained due to the very attractive salaries and excellent business opportunities offered to technical men by commercial interests. A further and, without doubt, very serious loss of services of many non-resident engineers would have been experienced had it not been for the ability of the Government to contract their services at salaries higher than allowed by the Appropriation Act. While this policy has relieved the situation temporarily, yet nevertheless it should not be counted upon as a permanent remedy and might be subject to criticism and if continued indefinitely may cause dissatisfaction among other technical employees of the Bureau. This Bureau firmly believes that if the Government is to embark upon an extensive public works program as all indications would seem to point—better and more commensurate remuneration should be offered to all the technical men in the service of this Bureau. Only in this way will it be possible to retain the services of experienced engineers and consequently to maintain the efficiency of this Bureau and to permit the Government to undertake economically and without delay its numerous public works projects.

PERSONNEL.

Number of employees paid direct from Bureau funds as of December 31, 1920: American, 33; Filipinos, 365.

(NOTE.—The corresponding figures for December 31, 1919 are 40 and 317, respectively).

Number of technical employees, December 31, 1920: Americans, 26; Filipinos, 117.

(NOTE.—The corresponding figures for December 31, 1919 are 31 and 121, respectively).

American technical employees.

	Classified.	Unclassified	Total.
Civil engineer	16	3	19
Assistant engineer	1	1	2
Electrical and mechanical engineer	2	0	2
Surveyor	1	0	1
Architectural draftsman	1	0	1
Structural draftsman	1	0	1
Total	22	4	26

Filipino technical employees.

	Classified.	Unclassified.	Total.
Civil engineer	23	4	27
Assistant civil engineer	14	5	19
Junior civil engineer	5	14	19
Surveyor	5	3	8
Junior surveyor	1	0	1
Assistant electrical engineer	1	0	1
Junior electrical engineer	1	0	1
Supervising architect	0	2	2
Architectural draftsman	10	0	10
Junior architectural draftsman	15	4	19
Supervising architectural draftsman	1	0	1
Assistant architectural draftsman	4	0	4
Superintendent of autos	1	1	2
Assistant superintendent of autos	1	0	1
Mechanical engineer	1	0	1
Structural draftsman	1	0	1
Total	84	33	117

CHANGES IN PERSONNEL.

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau, by whatever branch of the Government paid:

	Americans.	Filipinos.	Other foreigners.	Total in 1920.	Total in 1920.
Number of appointments	11	842	0	853	548
Number of transfers to Bureau	1	34	0	35	25
Number of separations for cause	1	20	0	21	10
Number of voluntary resignations	14	202	0	216	167
Number of separations due to economy	0	2	0	2	0
Number of transfers from Bureau	0	24	0	24	16
Number of separations due to retirement	2	0	0	2	2
Number of separations due to expiration of employment	0	4	0	4	0
Number of deaths	2	3	0	5	7
Number of employees actually in the service as of December 31, 1920	74	2,301	4	2,379	1,495

NOTE.—Item "Number of appointments" includes new and probational appointments. The apparent increase of appointments and of number of employees is due mainly to additional skilled laborers needed in the execution of increased public works projects, and who were appointed during the year.

The work accomplished by the Bureau of Public Works along various lines of activities is set forth in the following report and tabulations. Notwithstanding the shortage of personnel, the lack of materials in the local market and the excessive prices of same experienced during the year, the results obtained are very gratifying and can be favorably compared with the previous records of this Bureau.

The public works expenditures incurred under the supervision of this Bureau during the year amounted to ₱19,629,615.28, which is about 10 per cent more than the corresponding expenditures for the preceding year and which is the largest amount ever expended on Philippine public works in any one year.

While active road and bridge construction had been curtailed due to lack of funds, 198.5 kilometers of new first-class roads were completed and at the same time 4,601.3 kilometers of first-class roads were kept under proper repair and maintenance, which is the largest kilometerage of road ever maintained. Building construction assumed proportions never before attained; the construction of many modern public buildings of large dimensions having been started and actively undertaken during the year. The year 1920 marked the opening of activities in the greatest port works program ever launched for the improvement of port facilities in the Philippine Islands and at the close of the year work was in full swing on many projects throughout the entire archipelago.

Plans covering the construction of extensive irrigation systems in the principal rice producing provinces of the Islands to benefit 300,000 hectares of land were formulated. These systems are estimated to cost ₱60,000,000 and will greatly increase the rice production of the country—thus preventing the annual shortage of this cereal. Work on the first ten (10) irrigation systems which will benefit 22,314 hectares of land and which will cost approximately ₱2,460,500 was well under way at the close of the year.

The completion of 148 artesian wells and the construction of 16 waterworks systems which will serve approximately a total population of 365,000 inhabitants was realized at a cost of ₱1,049,725.63 in answer to the insistent demand of numerous communities for a supply of good drinking water. Of particular note is the fact that the establishment of these wells and waterworks has in every instance affected a marked improvement in health conditions.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS.

	Insular expenditures.				Provincial and municipal expenditures.		Fund from private sources.		Total.	
	Bureau of Public Works.		Appropriations controlled by other bureaus.							
	1919	1920	1919	1920	1919	1920	1919	1920	1919	1920
Roads and bridges	₱147,168.97	₱98,897.88	₱7,939.18	₱630,642.24	₱8,810,557.94	₱6,724,459.80	₱335.46	₱2,499.35	₱8,966,001.55	₱7,456,498.77
Buildings	1,560,422.18	1,678,623.98	256,576.21	936,817.16	2,566,696.27	2,637,978.40	3,676.67	79,466.83	4,387,671.28	5,332,886.32
Maintenance, alteration and repair of public buildings	320,784.18	395,234.79	62,272.44	80,067.97			21,696.96	116,853.37	404,953.58	592,156.12
River and harbor works including purchase and reconstruction of equipment, light, buoys, and beacons	1,042,333.27	1,395,202.83	543,006.40	1,844,179.41	23,026.05	29,539.64	52.73		1,608,418.45	2,769,000.38
Artesian wells and water supply	542,797.27	697,169.57	41,182.85	83,619.00	792,624.42	1,027,718.29	5,996.07	45,072.51	1,382,599.11	1,833,579.37
Irrigation projects	232,404.28	365,046.19	43,511.03		300.33		1,522.22	1,774.78	277,737.86	886,820.97
Operation of auto line, quarries and the supervision of motor vehicle traffic	338,112.63	375,000.00							338,112.63	375,000.00
Miscellaneous	6,941.51	7,579.29	122,536.12	198,384.23	278,592.82	519,828.12	37,824.61	42,881.70	445,894.56	763,673.34
Total	4,190,964.24	5,082,833.48	1,077,023.73	3,268,710.01	12,471,997.83	10,959,523.25	71,308.72	288,548.54	17,811,289.02	19,529,615.28

BALANCE SHEET, BUREAU OF PUBLIC WORKS.

		1919		1920
Current assets:				
Cash (collecting and disbursing officers)		₱523,405.14		₱1,182,203.92
Supplies and materials		673,022.26		787,907.96
Work in process		22,962.99		3,008.29
Accounts receivable		1,049,563.70		2,598,093.04
Investment and securities		400.00		400.00
Prepayments		2,990.83		18,263.14
Fixed assets:				
Real property and improvements [a]		₱25,567,879.51		20,325,814.70
Equipment	₱2,240,660.99		2,550,305.33	
Less depreciation	(1,190,001.88)	1,050,659.11	(1,156,044.56)	1,392,260.77
Total		28,890,883.54		34,305,851.82

	1919	1920
Current liabilities:		
Treasury account	₱2,257,412.03	₱3,466,104.12
Accounts payable	661,263.41	519,588.70
Undistributed collection		2,390.74
Accrued leave payable	143,112.58	217,850.51
Insurance reserve		350,233.09
Deferred credits to income	23,316.01	33,609.19
Loans from Postal Savings Bank fund		185,000.00
Deferred asset (Executive Building at Malacañang)		(185,000.00)
Surplus:		
Appropriated surplus	(613,359.11)	
Principal account surplus (fixed assets)	26,618,538.62	29,716,075.47
Total	28,890,883.54	34,305,851.82

[a] All previously completed insular improvements taken under fixed assets.

STATEMENT OF APPROPRIATION INCOME AND EXPENSE.

DEBIT.	1919	1920
Reversion of unexpended balance of administrative appropriation	₱226,207.81	₱181,762.11
Reversion of receipts	821,926.79	1,039,303.47
Operating expenditures offset by receipts	4,813,359.11	7,994,847.29
Expenditures administrative appropriation	969,231.69	1,173,714.11
Outlays, purchase of equipment	50,000.00	29,187.78
Balance brought forward to fiscal year 1920	(813,359.11)	
Total	6,067,365.79	10,418,814.76

CREDIT.	1919	1920
Appropriation of administrative expense of Bureau of Public Works (Expenditures partially offset by surcharges collected)	₱1,245,439.00	₱1,384,664.00
Overdraft incurred in the direct operation account.	(813,359.11)	
Receipts—Prime cost	4,813,359.11	7,994,847.29
Receipts—Surcharges	714,726.53	923,899.18
Receipts—Miscellaneous	43,558.31	50,636.11
Gain on supplies sold	3,669.88	4,446.09
Inventory—Adjustments	5,215.89	705.07
Income from rentals	32,604.35	23,564.37
Interest on investment and securities	280.00	160.00
Sales of fixed assets	11,771.21	3,641.20
Prior year's credit	10,100.63	32,251.45
Total	6,067,365.79	10,418,814.76

TRANSACTION AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) DURING 1920.

DEBITS.	Amount.
Principal account surplus, December 31, 1919	₱26,618,538.62
Purchase of equipment	29,187.78
Equipment acquired by transfer (See J. V. 27846 and 28162)	382.19
Fixed property brought into account	3,051,198.55
Equipment found at station, including worn-out tires taken into account (See J. V. 25904, 26254, 26522, 27019, 27129, 27408, 27868, 28160, 28163, 28571, 28598, 29028, 29327, 29787, 29815, 29937, 30030	1,709.97
Equipment acquired by construction	1,235.16
Inventory adjustment to offset ₱24.86 taken into equipment condemned and dropped (See credit side for this amount) also Bureau of Audits J. V. 297562 (B. P. W. No. 30239) re this adjustment of ₱24.86	24.86
Total debits	29,702,277.13

CREDITS.		Amount.
Equipment sold		₱3,480.54
Equipment condemned and dropped	₱9,266.99	
Plus cost of supplies erroneously dropped as equipment and debited under classification 5-E-z (See J. V. 29370)	24.86	9,291.85
Equipment dropped by transfer to provinces and municipalities (J. V. 26319 and 28113)		4,145.99
Equipment dropped by transfer to other Bureaus (J. V. 25854, 27814, 29397 and 29697)		1,227.79
Equipment dropped by adjustment (J. V. 27337)		12.81
Equipment issued to jobs		
Depreciation written off:		
(1) Actual depreciation (J. V. 30236)	247.79	
(2) Depreciation written off on a/c of equipment dropped on affidavits, undersold etc	(9,266.99)	
(3) Depreciation written off on a/c of adjustment (J. V. 27364)	(22,938.12)	(31,957.32)
Principal account surplus December, 1920		29,716,075.47
Total credits		29,702,277.13

OPERATION STATEMENT, BUREAU OF PUBLIC WORKS.

DEBIT.	1919	1920
Operating revenue:		
Rental	₱32,604.35	₱23,564.37
Surcharges	714,726.53	923,899.18
Gain on goods sold	3,669.88	4,446.09
Interest on investments and securities	280.00	160.00
Inventory adjustments	5,215.88	705.07
Other service income	53,658.94	86,526.76
Aid to local governments	155,169.58	134,410.64
Total	965,325.11	1,173,714.11

CREDIT.	1919	1920
Operating expense:		
Supervising, technical and clerical service—		
Salaries	₱661,487.51	₱832,449.02
Bonuses	103,710.10	119,676.82
Labor	49,210.58	57,173.99
Consumption of materials	62,041.23	65,977.26
Rental of buildings	13,620.00	16,096.45
Illumination and power service	9,500.25	13,099.36
Traveling expense of personnel	26,610.45	26,082.45
Repair service	18,305.86	17,163.28
Postal, telegraph, telephone and cable service	10,836.86	9,295.17
Other expense	10,002.27	16,700.81
Total	965,325.11	1,173,714.11

THE LARGER RESULTS OF THE YEAR'S WORK.

Surfaced roads constructed and designated first class	(kilometers)	192.5
Reinforced concrete bridges and culverts completed (In this figure, concrete pipe culverts are not included)	(number)	13
Successful deep wells completed	do	148
Reinforced concrete buildings completed (including only buildings of over 100 cubic meters capacity)	do	42

EXPENDITURES SUPERVISED DURING THE YEAR 1920 AS COMPARED WITH THE YEAR 1919.

	1919	1920
Total expenditures	₱17,811,289.02	₱19,529,615.28
Total expended upon road and bridge work	8,966,001.85	7,456,498.77
Total expended upon building work	4,792,524.86	5,925,042.45
Total expended upon port work	1,608,418.43	2,769,000.38
Total expended upon water supply	1,382,599.11	1,865,579.37
Total expended upon irrigation projects	277,737.06	395,880.97
Operation of auto line, quarries and the supervision of motor vehicle traffic	338,112.63	375,000.00

(Expenditures on miscellaneous items account for the balance.)

ROAD WORK.

Length of roads in existence.

	December 31, 1919.	December 31, 1920.
	Kilometers.	*Kilometers.*
First class	4,500.3	4,698.8
Second class	1,986.0	2,037.5
Third class	3,109.2	3,079.8
Total	9,595.3	9,816.1

Relation of first-class road construction and maintenance.

Fiscal year ending December 31—	Designated first-class road at end of year.	First-class road constructed during year.	Average maintained throughout the year by the caminero system.
1916	3,436.2	368.5	3,226.8
1917	3,738.7	229.1	3,616.1
1918	4,090.2	351.5	4,023.4
1919	4,500.3	410.1	4,444.2
1920	4,698.8	398.5	4,601.3

The term "designated first-class road" means surfaced road maintained by the caminero (cantonnier) system under specific agreement between the Insular Government and each separate province.

DEFINITIONS FOR ROAD CLASSIFICATIONS.

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. Those roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry seasons, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first-class and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Road in existence in the various provinces of the Philippines as of December 31, 1920.

Province.	First-class road.	Second-class road.	Third-class road.	Total road.	Trail.
	Kilometers.	*Kilometers.*	*Kilometers.*	*Kilometers.*	*Kilometers.*
Abra	48.2	20.8	5.8	74.8	68.9
Agusan	16.6	5.8	19.6	42.0	33.8
Albay	179.5	48.7	54.9	283.1	83.6
Antique	94.5	89.4	36.8	220.7	16.5
Baguio	39.3	.7	2.2	42.2	2.2
Bataan	34.6	20.6	2.3	57.5	75.7
Batangas	179.0	20.1	162.5	361.6	40.5
Benguet	74.3	3.7	4.8	82.8	----------
Bohol	185.2	67.0	55.8	308.0	10.2
Bukidnon	----------	114.3	16.7	131.0	92.0
Bulacan	103.9	118.6	67.5	310.0	----------
Cagayan	49.9	110.4	18.9	179.2	139.8
Camarines Norte	24.0	----------	22.9	46.9	----------
Camarines Sur	138.0	25.3	47.5	210.8	25.2
Capiz	169.7	104.0	15.8	289.5	142.1
Cavite	84.4	19.9	98.5	202.8	22.9
Cebu	291.5	240.8	106.7	639.0	55.5
Cotabato	11.5	3.8	51.1	66.4	167.5
Davao	5.6	3.9	53.7	63.4	599.9
Ilocos Norte	76.2	110.3	1.5	190.0	----------
Ilocos Sur	160.3	2.1	10.5	172.9	----------
Iloilo	259.6	37.7	156.6	453.9	14.9
Isabela	81.1	28.1	116.0	225.2	----------
Laguna	146.9	19.8	65.3	232.0	29.4
Lanao	25.9	34.6	21.8	82.3	259.8
La Union	80.6	34.8	35.2	150.8	16.6
Leyte	117.8	62.0	80.5	260.3	22.2
Marinduque	40.3	.3	10.3	50.9	----------
Mindoro	19.0	38.0	5.8	62.8	80.4
Misamis	99.2	91.9	61.6	252.7	134.8
Mountain Province	4.0	37.5	299.5	341.0	1,022.8
Nueva Ecija	139.0	35.3	229.2	403.6	36.7
Nueva Vizcaya	32.2	11.4	84.2	127.8	127.1
Occidental Negros	266.4	24.2	241.9	532.5	56.5
Oriental Negros	133.7	18.0	81.1	232.8	194.3
Palawan	----------	8.0	28.0	36.0	380.0
Pampanga	192.1	51.3	91.9	335.3	----------
Pangasinan	309.3	96.2	237.2	642.7	----------
Rizal	157.5	26.5	9.1	193.1	18.1
Romblon	----------	----------	2.6	2.6	292.9
Samar	103.4	44.7	91.2	239.3	----------
Sorsogon	113.7	72.3	27.1	213.1	----------
Sulu	34.2	21.8	9.8	65.8	69.6
Surigao	44.9	2.0	10.8	57.7	----------
Tarlac	104.0	8.6	59.3	171.9	26.6
Tayabas	137.2	31.1	56.9	227.2	----------
Zambales	32.3	49.2	38.7	120.2	23.4
Zamboanga	55.9	22.0	50.2	128.1	105.8
Total roads	4,698.8	2,037.5	3,079.8	9,816.1	4,490.2

Type of surfacing.

	December 31, 1919.	December 31, 1920.
	Kilometers.	*Kilometers.*
Stone	1,452.9	1,429.8
Gravel	3,067.0	3,059.4
Coral	1,247.2	1,450.5
Unsurfaced	3,828.4	3,876.4
Total	9,595.5	9,816.1

ROAD MAINTENANCE.

Average number of kilometers maintained.

	1919	1920
Caminero system	4,444.2	4,601.3
Gang system	3,152.5	3,030.1
Total	7,596.7	7,631.4

Total cost of road maintenance.

	1919	1920
Caminero system	₱3, 223, 119. 18	₱3, 197, 202. 28
Gang system	696, 440. 38	745, 351. 19
Total	3, 919, 559. 56	3, 942, 558. 47

Average cost of maintenance per kilometer per year.

	1919	1920
Caminero system	₱725. 24	₱694. 85
Gang system	220. 92	245. 98

The length of road designated first-class and the length of road under caminero maintenance are as nearly identical as conditions permit.

BRIDGES.

Durable bridges and culverts in existence.

Fiscal year ending December 31—	All durable structures.	
	Total number.	Increase during year.
1916	7, 156	516
1917	7, 870	214
1918	7, 426	56
1919	7, 491	65
1920	7, 521	30

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick, and all substantial stone structures whether of adobe or other material. The increase in the number of structures is not identical with the number of structures built, not only because with the extension of the work of the Bureau to new territory the old work existing is reported for the first time, but also because of the occasional loss of a structure. The above figures are obtained from semi-annual reports of district engineers.

Reinforced concrete structures in existence.

Fiscal year ending December 31—	Total number.	Total meter span.
1916	3, 978	15, 297
1917	4, 188	16, 420
1918	4, 233	16, 672
1919	4, 276	16, 714
1920	4, 302	16, 938

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other classes of construction.

BUILDINGS.

The figures in the tabulation below exclude all structures of less than 100 cubic meters in content:

All durable buildings completed.

Fiscal year ending December 31—	Total number.	Total content cubic meter.	Per cent reinforced concrete by content.
1916	112	261, 496	85
1917	82	160, 888	70
1918	84	220, 943	56
1919	76	159, 254	64
1920	82	229, 653	65

Buildings, in these tabulations, are classified as reinforced concrete when the outside walls, or, in the case of markets, the interior posts, are of that material.

Number of markets and schools completed.

Calendar year.	Markets and tiendas.	Schools.
1916	17	67
1917	18	32
1918	19	27
1919	11	19
1920	12	47

ARTESIAN WELLS.

Successful deep wells driven by fiscal years.

1916	122
1917	108
1918	165
1919	163
1920	148

A total of 1,204 artesian wells are now supplying potable water to the inhabitants of the Philippines.

Total expended upon wells.

	1919		1920	
	Pesos.	Per cent.	Pesos.	Per cent.
Successful wells	344, 959. 96	93	432, 013. 18	93
Unsuccessful wells	27, 383. 41	7	35, 331. 68	7
Total	372, 343. 37	100	467, 344. 86	100

NOTE.—Average cost of drilling per meter: ₱30.29, 1919; ₱28.28, 1920.

Summary of deep well driving, 1920.

	Number.	Total depth in meters.	Total flow in liters per minute.
Successful:			
Flowing	35	4, 414	7, 995
Pumping	113	9, 246	13, 139
Total:			
Successful	148	15, 104	21, 134
Unsuccessful	17	2, 291	----------

NOTE.—Percentage of unsuccessful wells drilled: 7, 1919; 10, 1920.

The wells completed by this Bureau for the year number 165, with a total amount of 17,384 meters drilled.

The successful wells will furnish potable water to approximately 331,000 people.

Twenty-seven drilling machines were in operation during the year, but due to delays of various provinces and municipalities concerned in forwarding their resolutions requesting the drilling of wells, the machines were only operated intermittently.

Four new "star" drilling machines have just arrived from the United States, one of which is now drilling in Lipa, Batangas, and the other three will be placed in operation as soon as the drilling tools which are due from the United States arrive.

Pangasinan has been the most fortunate province; 19 successful wells having been drilled there during the year, with an average flow of 91 gallons per minute.

The average cost of drilling wells in 1920 was ₱28.28 per meter, or ₱8.62 per foot, including materials and supplies, depreciation of equipment and other charges such as labor, transportation, etc.

REGISTRATION AND REGULATION OF MOTOR VEHICLES.

During the year there were 4,149 new motor vehicles registered and 9,344 re-registered, or a total of 13,493, which is about 69 per cent over the number of vehicles registered in the previous year. Four thousand five hundred applicants for motor vehicle driver's licenses were also examined and 3,941 driver's licenses issued. The number of licenses renewed during the year was 11,323, making a total of 15,264 driver's licenses, and 8,689 student permits issued.

Eighty-four motor vehicles were withdrawn from service. Most of these vehicles were shipped to Shanghai and Singapore while others were rendered unserviceable.

ACCIDENTS AND FINES.

The following will show the results of the campaign conducted during the year against unreliable chauffeurs:

Number of cases reported during first quarter		430
Number of cases reported during second quarter		637
Number of cases reported during third quarter		584
Number of cases reported during fourth quarter		571
Total		2,222
Number of deaths reported during the year		25
Number of speeding cases reported during first quarter		225
Number of speeding cases reported during second quarter		187
Number of speeding cases reported during third quarter		102
Number of speeding cases reported during fourth quarter		92
Total		606
Percentage of speeding cases during first quarter	Per cent	52.3
Percentage of speeding cases during second quarter	do	29.3
Perceatnge of speeding cases during third quarter	do	17.5
Percentage of speeding cases during fourth quarter	do	16.0
Number of licenses suspended during the year		166
Number of licenses revoked during the year		38
Number of convictions with imprisonment		145
Total collection from fines during the year		₱49,919

Provisions of the automobile laws most commonly violated.

Number of violations.	Sections and Acts violated.
606 (speeding)	Section 24, 2159
418 (lights)	Section 2, 2639
198 (capacity and persons on running boards)	Section 9, 2587
241 (cutting corners)	Section 11, 2256
138 (suspensions and revocations)	Section 6, 2587
93 (plates)	Section 4, 2256
57 (smoke)	Section 36, 2159

COLLECTIONS.

The funds collected during the year under the existing laws were ₱177,643.24 as against ₱113,909.11 for 1919.

FUNDS.

The amount appropriated during the year for the registration of motor vehicles was ₱60,000, and an additional amount of ₱15,000 was requested to carry out the provisions of the motor vehicle laws.

During the Antipolo season and following the practice of previous years, this office, with the cooperation of the Philippine Constabulary, established guards, distributed as follows: One station in Pasig, one in Taytay, and one in Antipolo. During the month of May over 15,000 automobiles made trips to and from Antipolo. To regulate the time of all automobiles making trips from one station to another, a card was given to each driver with the time of his arrival and departure shown thereon. By this arrangement the time consumed by automobiles between points was controlled. This system gave very satisfactory results and no serious accident occurred.

In order to tax the motor vehicles in proportion to the damages they cause to the roads a proposed law was prepared and submitted through the Department of Commerce and Communications and the Finance Commission to the Legislature, looking to an increase of the present motor vehicle fees. It was proposed therein that the proceeds derived from motor vehicle registration be distributed to the provinces in proportion to the number of vehicles registered in each province and to be expended on the maintenance and repairs of roads.

BENGUET AUTOMOBILE LINE.

The popularity of Baguio as a summer and health resort was again demonstrated by the increased volume of traffic handled by the Benguet Automobile Line during the year. The following tabulation will show that 7,302 passengers with 114,960 kilos of baggage passed over this line during the year 1920, representing an increase of approximately 13 per cent over the corresponding figures for the preceding year.

	First class passenger.	Second class passenger.	Hand baggage kilos.	Express and freight kilos.
January 1 to March 31	918	349	85,820	244,115
April 1 to June 30	1,518	2,436	8,280	233,531
July 1 to September 30	113	594	6,160	61,756
October 1 to December 31	412	962	14,700	299,247
Total	2,961	4,341	114,960	838,649

The motor vehicle equipment of the Benguet Automobile Line consisted of 11 touring cars, 6 passenger trucks and 6 freight trucks.

THE PRESENT USE OF THE BENGUET AND NAGUILIAN ROADS.

The following tabulation which shows the volume of traffic that passed over the Benguet and Naguilian Roads during the year 1920 should be of importance to those interested in the development of the City of Baguio and in its possibility of becoming the capital of the Philippines.

	Pedestrians.	Bull carts.	Animals led or ridden.	Calesas.	Motorcycles.	Auto passengers.	Auto trucks.	Wagons.
BENGUET.								
January 1 to March 31	-------	-------	-------	-------	-------	-------	-------	-------
April 1 to June 30	2,140	813	1,198	-------	45	2,063	903	28
July 1 to September 30	1,569	807	1,836	-------	9	487	504	0
October 1 to December 31	2,900	975	3,344	-------	248	1,242	970	63
Total	6,609	2,095	6,378	-------	302	3,792	2,377	91
NAGUILIAN.								
January 1 to March 31	-------	-------	-------	-------	-------	-------	-------	-------
April 1 to June 30	4,366	2,246	270	5	107	1,622	1,883	654
July 1 to September 30	2,436	1,416	130	2	49	352	947	226
October 1 to December 31	2,321	2,161	130	-------	96	822	1,503	198
Total	9,123	5,823	530	7	252	2,796	4,283	1,078

CONSTRUCTING DIVISION.

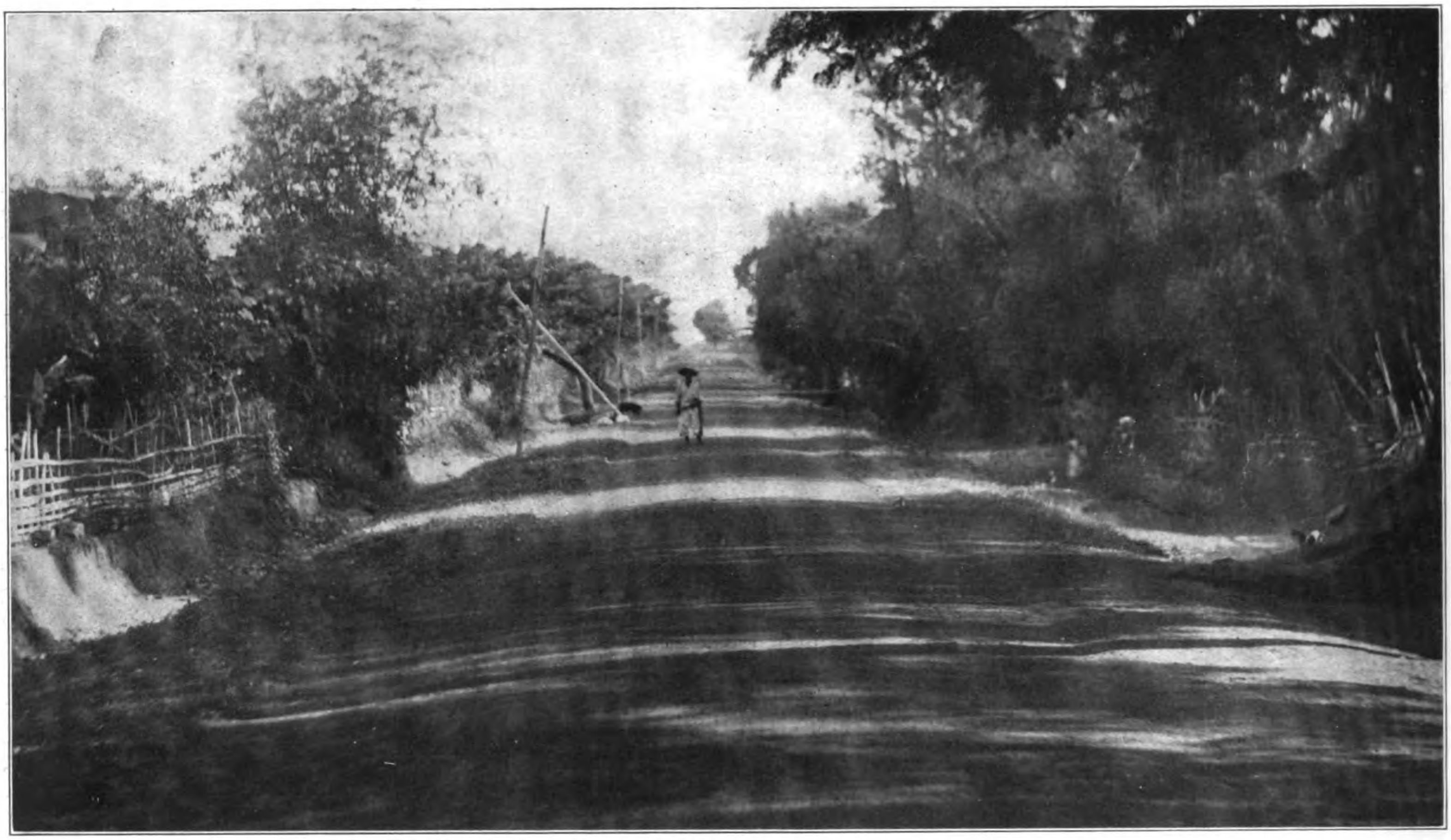
MARCIAL KASILAG, *Acting Chief Constructing Engineer.*

ROADS.

Road construction in the Philippines has already reached a point where all the provincial road and bridge funds together with the regular allotments from the Insular Government are just sufficient for the maintenance of all existing roads, and where the construction of new roads would be but a continuous source of financial embarrassment on the part of the Government and, more especially, on the part of the provinces. It is also apparent that the water-bound macadam roads have, in many sections of Philippine highways where heavy traffic has developed, been proving entirely inadaptable and very expensive to maintain, and it is obvious that the introduction of more permanent and durable types of road pavements to withstand economically the strain of intense motor traffic requirement is urgent. The initial cost of such permanent types of road will, without doubt, represent a large outlay of road funds, but it must be admitted that their construction will stop the vast expenditures of road funds incurred in the maintenance of many macadamized road sections which are no longer adaptable to accommodate the great volume of traffic, and that in the long run such permanent types of road will prove most economical.

In view of the above this Bureau has recommended that the Philippine Legislature be requested to give serious consideration and study of the problem of road construction and maintenance in the Philippines, involving the proper financing of roads, the increase of present road taxation, the issuance of bonds for the construction of more permanent and durable types of road pavements, and the adoption of a general road policy and program so essential to the efficient administration of roads.

The total number of kilometers of first-class roads, as of December 31, 1920, is 4,698.8 as compared with 4,500.3 kilometers of first class roads in existence at the end of the year 1919, or an increase of 198.5 kilometers, the greater portion of which was accomplished with insular funds. It is anticipated that no further new road construction of any importance would be undertaken during the year



Km. 163, Camiling–Tarlac Road, Tarlac Province.

1921 unless the provincial road and bridge funds and the revenues of the Insular Government are increased.

Tabulation of the increase in road kilometerage during 1920, by provinces.

Province.	Roads in existence, December 31, 1919.	Roads in existence, December 31, 1920.	Increase during 1920.
	Kms.	*Kms.*	*Kms.*
Abra	41.4	48.2	6.8
Albay	168.8	179.5	10.7
Antique	83.9	94.5	10.6
Baguio	38.9	39.3	.4
Batangas	175.1	179.0	3.9
Bohol	177.2	185.2	8.0
Bulacan	98.2	103.9	5.7
Cagayan	45.8	49.9	4.1
Camarines Sur	137.4	138.0	.6
Capiz	158.1	169.7	11.6
Cavite	81.0	84.4	3.4
Cebu	289.5	291.5	2.0
Cotabato	12.2	11.5	(a) .7
Ilocos Sur	155.2	160.3	5.1
Iloilo	247.4	259.6	12.2
Isabela	78.3	81.1	2.8
Laguna	144.8	146.9	2.1
Lanao	20.6	25.9	5.3
La Union	72.1	80.8	8.0
Marinduque	38.6	40.3	1.7
Mindoro	17.3	19.0	1.7
Nueva Vizcaya	30.2	32.2	2.7
Occidental Negros	247.7	266.4	18.7
Oriental Negros	122.5	133.7	11.2
Pampanga	186.4	192.1	5.7
Pangasinan	296.6	309.3	12.7
Rizal	154.5	157.5	3.0
Samar	99.2	103.4	4.2
Sorsogon	111.7	113.7	2.0
Sulu	32.4	34.2	1.8
Surigao	35.0	44.9	9.9
Tarlac	93.6	104.0	10.4
Tayabas	136.2	137.2	1.0
Zambales	23.1	32.3	9.2
Total			198.5

(a) Due to road relocation and subsequent shortening.

NOTE.—No new road construction was undertaken in the provinces not listed above.

Among the most important road construction projects undertaken during the year, the following may be mentioned:

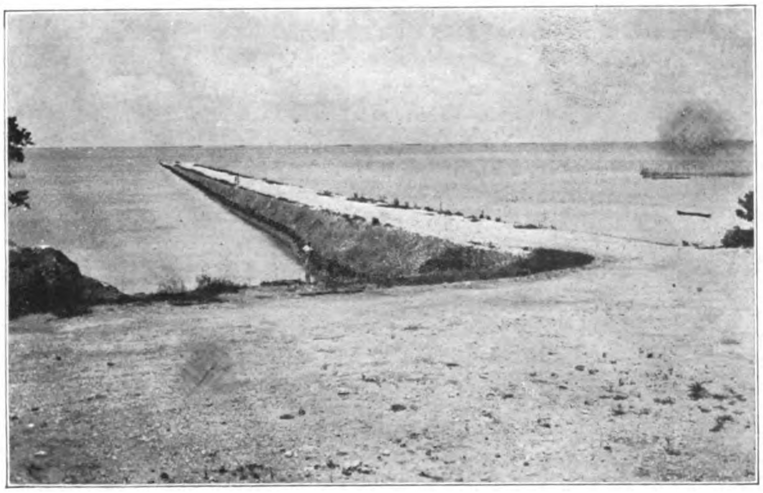
Antique–Capiz Interprovincial Road, connecting the municipalities of Pandan, Antique, and Navas, Capiz. The distance of 13.5 kilometers obtained in the preliminary survey of this road has been reduced to 12.85 kilometers in the construction. With the exception of bridges, the road has been completed first class and opened to traffic in the month of September. The bridges have been built of timber only for lack of sufficient funds for the construction of permanent structures. However, the construction of these temporary structures was fully justified by the early opening of the road to automobile traffic, by which the people of northern Antique have been enabled to emerge from their long isolation from commercial intercourse with the other parts of the Islands. It is now possible for them to make connection, in less than half a day, with the boats

Dauis Causeway, joining Panglao Island to Bohol Island.

Kilometer 61, Dumaguete–North Road, Oriental Negros Province.

touching regularly at the port of New Washington on the north coast of Capiz.

Iloilo–Antique Interprovincial Road, connecting the two provinces through the town of San Joaquin on the Iloilo side and San Jose on the Antique side. The distance between these two towns is 43.7 kilometers, but the road under actual construction is only 23.5 kilometers long, the road for the rest of the distance having been constructed in previous years. Little progress was made in the construction of this road during 1920 on account of shortage of labor when the funds were made available for expenditure, which funds being Insular allotments. The receipt of the money coincided with the harvest season in both provinces. Nevertheless, 1.2 kilometers of heavy grading work, 1.3 kilometers of first course surfacing and the construction of two temporary bridges were accomplished on the Antique side. On the Iloilo side the subgrade has been completed to the boundary, but serious slides occurred during the rainy season which will cost a considerable amount of money to remove.



Tagbilaran Causeway, Bohol.

Pilar–Balasan Interprovincial Road, connecting the Provinces of Capiz and Iloilo through Pilar, Capiz, and Balasan, Iloilo. The road is 11½ kilometers long and traverses sugar plantation and rice fields. It serves as a feeder to the railroad at the Panitan station. The entire subgrade has been completed and temporary bridges put in.

Loctugan–Ivisan–Sigma Road, Province of Capiz.—This road forms the connecting link of the main road from Capiz, the capital, to Dumarao, the southernmost town of the province. Of its total distance of 21.5 kilometers 16 have been completed first-class. The subgrade for the remaining 5½ kilometers has also been finished.

Logo–Taboilan Road, 21 kilometers long, connecting the east and west coasts of the northern part of the Island of Cebu. Eleven (11) kilometers have been completed first class.

Cebu–North Road.—The section under construction is from Dayhagon canal, kilometer 106 to Daan-Bantayan, kilometer 128. It is a continuation of the road system which starts from Cebu the capital of the province, and ends at Daan-Bantayan, the last town at the north end of the Island. The work accomplished during the year includes the surfacing of 3 kilometers of subgrade built in the preceding year, the resurfacing of kilometer 17 and the construction of a 4-meter span temporary bridge at kilometer 62.

Isabela–Guijulngan Interprovincial Road, connecting the two Negros Provinces through the town of Isabela, Occidental Negros, and Guijulngan, Oriental Negros. The final location survey of this most difficult piece of road construction has been finished and the

Catbalogan-North Road. Trail construction, Samar Province.

plans, profiles and estimates will be approved as soon as the few necessary changes noted on the Oriental Negros side to obtain the allowable maximum grade of 5 per cent are effected. Approximately 7 kilometers of subgrade have been built from the Isabela end of which 5 kilometers have been surfaced.

Naga–Pasacao Road, 26.2 kilometers in length.—This is the most important road under construction at present in the Province of Camarines Sur, as it will form the connecting medium for a through railroad service between Manila and the Bicol provinces, by way of the Ragay gulf, which the Manila Railroad Company expects to inaugurate in the near future. The total subgrade and the bridging of stream crossings, with the exception of the Bicol River, have been finished up to the junction just south of the town of Pamplona. The section from this junction to Pasacao is in second-class condition. In view of the decision of the Manila Railroad Company to extend the Bicol line to Pamplona, it is now planned to convert the second-class road from Pasacao to the railroad station at Pamplona into a first-class road, and for this purpose ₱50,000 insular allotment has been assigned for expenditure on this project during 1921. At this juncture it might be of interest to mention that the Naga–Pamplona section of this road will eventually become a part of the proposed interprovincial road which will connect the Provinces of Camarines Norte and Camarines Sur.

Albay–Sorsogon Interprovincial Road, 52.5 kilometers long.—Only 9 kilometers of the entire subgrade of this road remains to be opened on the Sorsogon side. The Albay section of 11.4 kilometers has practically all been completed first class but the Sorsogon section has only the first 9.3 kilometers surfaced.

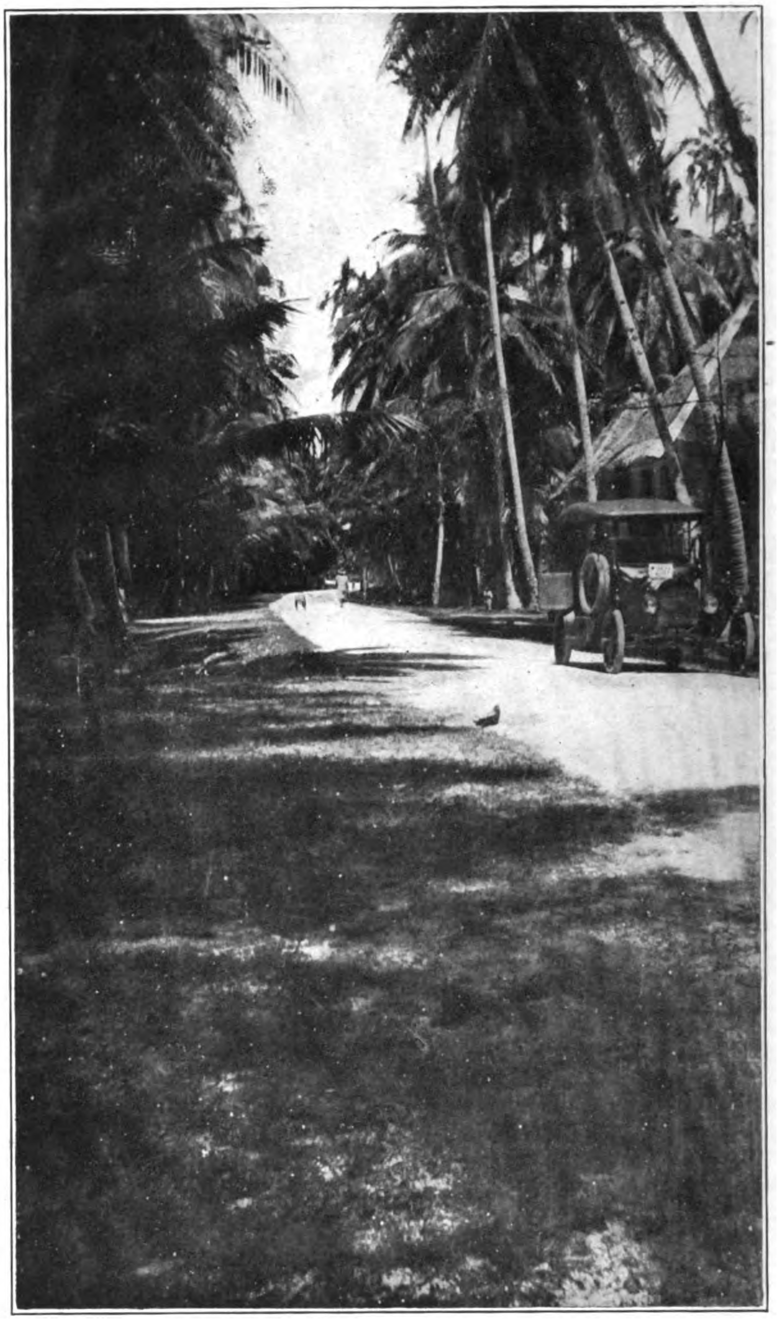
Lucban–Sampaloc–Mauban Road, Tayabas Province.—Length, 30 kilometers. Of the distance of 10 kilometers from Lucban to Sampaloc, 15 kilometers has been graded with 9 kilometers surfaced with first course stones, and three (3) kilometers of horse-trail opened. Traveling between Lucban and Sampaloc is now done over these finished subgrade and trail, and the old Bitucang-Manoc, famous for its very steep long grades and loose stone boulders, has been discarded. The section of the road from Sampaloc to Mauban is passable as a third-class road.

Tiaong–Dolores Road, Tayabas Province, 9 kilometers long.—This is a feeder road for the town of Dolores to the railroad station at Tiaong. The first kilometer at the Tiaong end has been completed and declared first class, and other kilometer surfaced with first course stones. The rest of the road is classified as third class.

Panaon–Unisan Road, Tayabas Province, 7 kilometers long.—This is a feeder road for the town of Unisan to the railroad station at Panaon. About 40 per cent of the subgrade work has been finished.

Pagsanjan–Luisiana via Cavinti Road, Laguna Province, 18 kilometers long.—The entire subgrade of this road is about 90 per cent completed.

Calauan–Santa Cruz Road, 20.6 kilometers long, Province of Laguna.—The Santa Cruz–Pila section of this road, a distance of 9 kilometers, is practically completed. Only 600 lineal meters at the Pila end remains to be surfaced. This road is a short cut between Manila and Santa Cruz, being 26.5 kilometers shorter than the route via Nagcarlan and San Pablo on the Manila–South Road.



View of a section of Tagbilaran-East Road, Bohol.

Bolboc–Candelaria Interprovincial Road, connecting the provinces of Batangas and Tayabas through the towns of Bolboc, Batangas and Candelaria, Tayabas.—This road is 14.60 kilometers long. Of the Tayabas section 6.7 kilometers have been completed and declared first class, and only 250 lineal meters of subgrade remain to be surfaced. Only the subgrade has been finished on the Batangas side.

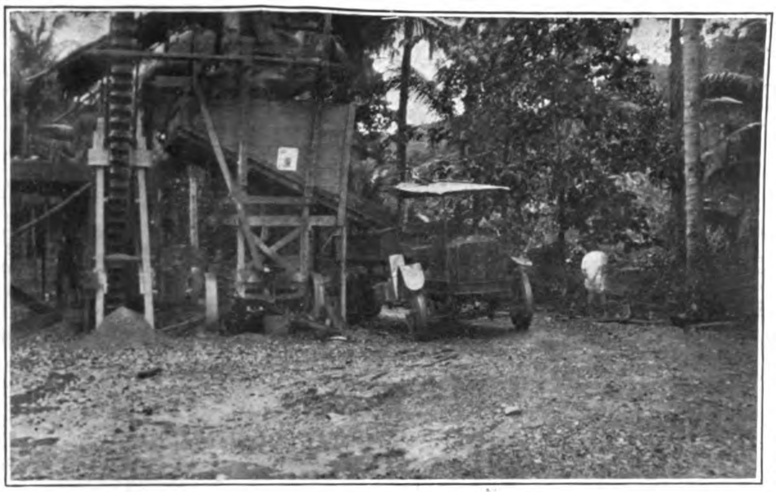
Tarlác–South Road, 30 kilometers long from Tarlac, the capital of the province, to the boundary of Pampanga.—Practically 3 kilometers of first-class construction between Tarlac and Capas has been added to the completed sections of this road. The unfinished sections are found between the two railroad crossings south of Capas, 8 kilometers long, and between the Pampanga boundary and the barrio of Santiago, 5 kilometers long, or a total of 13 kilometers. The subgrade of these unfinished sections has been constructed so that, if sufficient funds should become available by 1922, the surfacing could be completed during that year. The construction of four (4) wooden bridges was also accomplished during the year.

Near view of portable crusher showing cast iron wheels under crusher, Leyte.

Tarlac–Camiling Road, Province of Tarlac, 32 kilometers long—The Camiling–Santa Ignacia section of this road, 9 kilometers long, has been completed first-class. Ten (10) kilometers of subgrade has been constructed between Tarlac and Santa Ignacia. Since the construction of this road was started, many homesteaders have settled on the extensive agricultural lands traversed by it. When it is completed, it will become a very important interprovincial means of communication between Pangasinan and Tarlac.

Pura–Guimba Interprovincial Road, connecting the provinces of Tarlac and Nueva Ecija through the towns of Pura, Tarlac, and Guimba, Nueva Ecija, over a distance of 8.8 kilometers.—The entire subgrade of this road has practically been completed, and in addition, 2 kilometers were surfaced and all the temporary bridges constructed during the last quarter.

Pampanga–Bataan Interprovincial Road, connecting the two provinces through the town of Lubac, Pampanga, and a barrio called Colis, municipality of Dinalupihan, Bataan.—The length of this road is 16.18 kilometers. The 3.8 kilometers of subgrade built in the preceding year was surfaced during the year. Only 2 kilometers on the Pampanga side, for which sixty per cent (60%) of the surfacing materials has been delivered remain to be surfaced. The sections finished in previous years suffered considerable damage during the big floods of July, August and September, 1920. However, the entire road is expected to be finished in first-class condition during 1921.



Front view of portable crusher plant. Note truck and Troy trailers under bins, Leyte Province.

Bataan–Zambales Interprovincial Road, connecting the two provinces through Dinalupihan, Bataan, and Subic, Zambales.—This road is 46.5 kilometers in length. About 6 kilometers of subgrade on the Zambales side, between Subic and Olongapo, and 8 kilometers on the Bataan side, have been constructed.

Nueva Ecija–Nueva Vizcaya Interprovincial Road, 60 kilometers long, connecting the two provinces through the town of San Jose, Nueva Ecija (Km. 160) *and the barrio of Santa Fe* (Km. 220) *near the South-West boundary of Nueva Vizcaya.*—During the year the following work was accomplished:

9 kilometers of subgrade (Km. 167—Km. 176) 4 to 6 meters wide.
16 kilometers of horse trail (Km. 188—Km. 220) 1 to 3 meters wide.
3 kilometers of clearing through level and wooded country between Puncan and Kamangahan.
12 kilometers of the old trail from Puncan (Km. 176) to Kamangahan (Km. 188) improved and made passable for automobiles during the dry season.

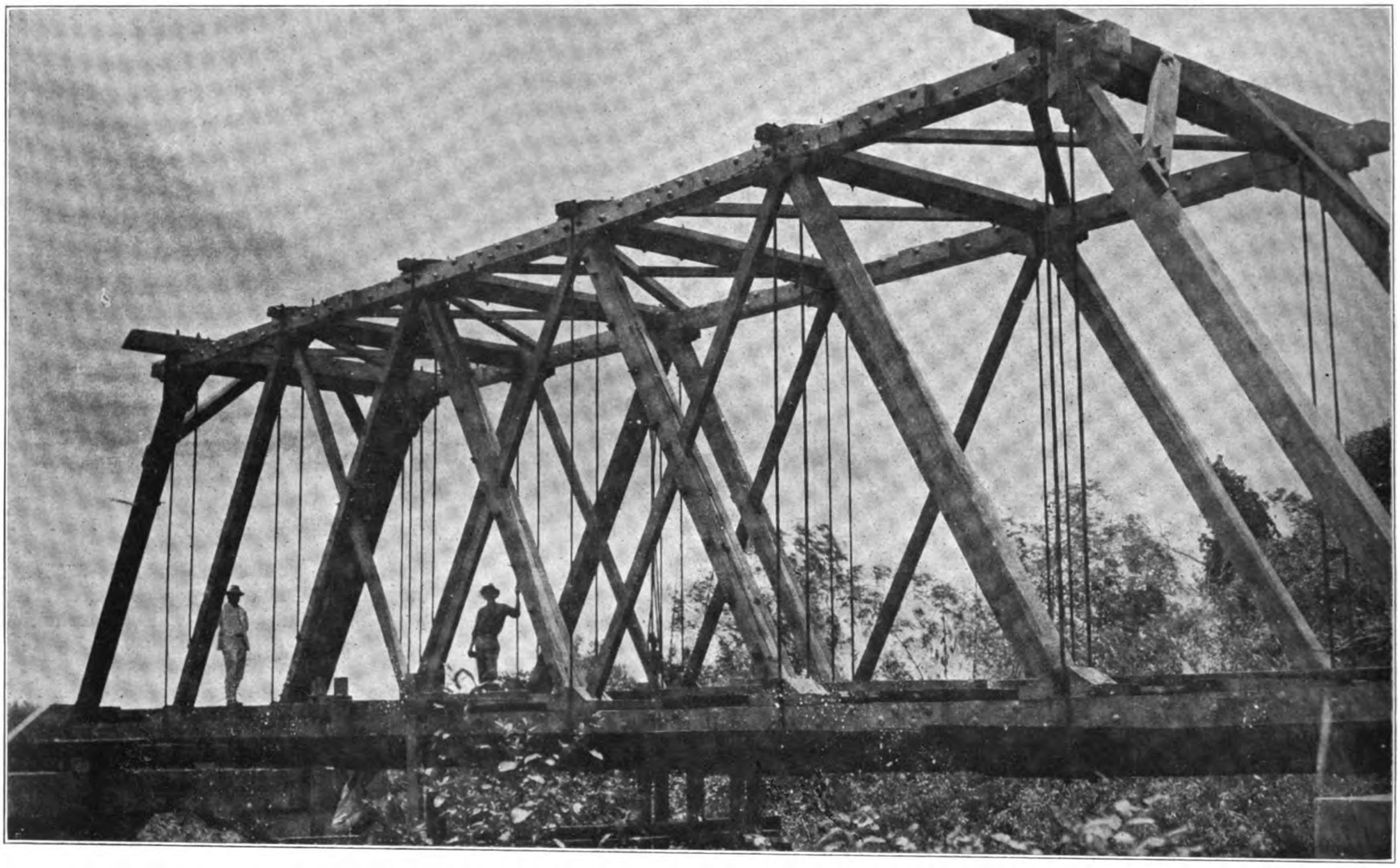
As this road stands at present, a trip may be made over it during the dry season as follows:

(*a*) By automobile from San Jose (Km. 160) to Kamangahan (Km. 188).
(*b*) On horse back from Kamangahan to Santa Fe (Km. 220) over the new trail.

Military Cut-off, Benguet Road.—A new cut-off from the Benguet Road, via Camp John Hay, was built during the year. This was intended as an emergency road to be used only in the case that the Baguio Hospital slide should again cut out and close the present Benguet Road. It is 2 kilometers longer than the Benguet Road, but the maintenance is the same, in so far as the Insular Government is concerned, for the reason that the military have agreed to maintain a section within their post.

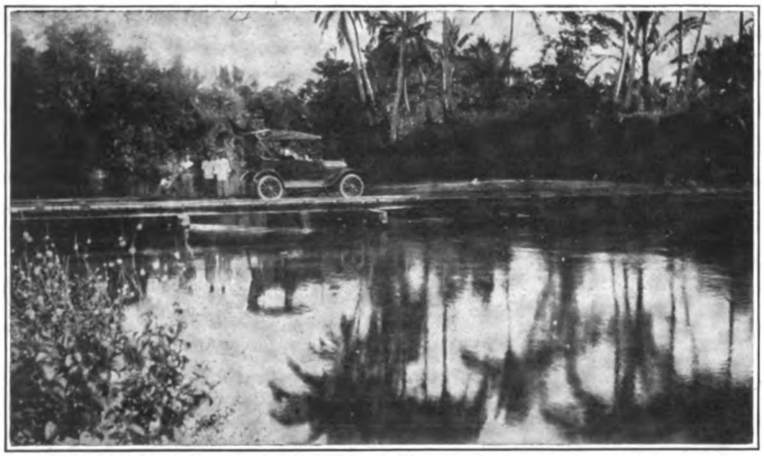
Bangued–Tangadan Road, connecting Bangued, the capital of Abra Province, with the Manila–North road at kilometer 422.3 in the Province of Ilocos Sur.—The road is 19.6 kilometers long and follows the broad Abra River for about 15 kilometers, then it goes over a long range of mountains into the Tangadan Valley and connects with Ilocos Sur on the top of the Tangadan mountain, which is about 200 meters above sea level. As a scenic road, it has few rivals and it is of especial interest as being the first improved road to connect the isolated Province of Abra with the coast.

Vigan–South Road.—This is a part of the Manila–North Road. The road proper has been completed in previous years, and the only remaining work to be accomplished is the construction of permanent structures to replace the existing temporary structures. The following structures were built during the year: one consisting of four 7-meter reinforced concrete slab and girder spans; one consisting



A combination Howe-truss bridge over Bunsuran River, Km. 37, Bigaa–Pandi–Angat Road, Bulacan.

of three 7-meter reinforced concrete slab and girder spans; one consisting of two 7-meter reinforced concrete slab and girder spans, and one consisting of one 7-meter reinforced concrete slab and girder span—all on reinforced concrete pile bents—one reinforced concrete box culvert, 4.80 meters span; one reinforced concrete box culvert, 4.50 meters span; two Armco double pipe culverts 0.91 meter diameter; one Armco pipe culvert 0.91 meter diameter and one reinforced concrete double pipe culvert 0.61 diameter.



Looulan Bridge, Misamis–North Road.

Bangui–Claveria Road, connecting the Provinces of Ilocos Norte and Cagayan through the town of Bangui, Ilocos Norte and Claveria, Cagayan, over a distance of 60 kilometers.—The construction of this road was started both ways from Camp Banua, a point about halfway between Bangui and Claveria. From Banua to Bangui 16.5 kilometers of trail of from 2 to 4 meters wide have been completed and connected with the old trail to Bangui. From Banua to Claveria 15½ kilometers of trail, from 2 to 3 meters wide, and 10½ kilometers of standard subgrade partially surfaced, have been constructed. This road has been opened for pack animal traffic only during the dry season. During the rainy season traveling over it is met with great difficulties on account of the numerous stream crossings that have not been bridged.

San Fernando–Poro Road, Province of La Union.—This is a 3-kilometer branch road from the Manila-North road leading to the San Fernando wharf under construction, just south of the town of San Fernando. It has been completed and declared first-class on December 31, 1920.

Bamboo pontoon bridge, Bancal River, Zambales. Cost, ₱2,330; capacity, 1,500 kilos.

Bauno–Timbañgan 2-room school, semi-permanent timber structure with concrete piers and concrete outside steps with malthoid roofing, at Km. 7, Maimbung Road, Jolo, Sulu, P. I. Cost, ₱5,078.17.

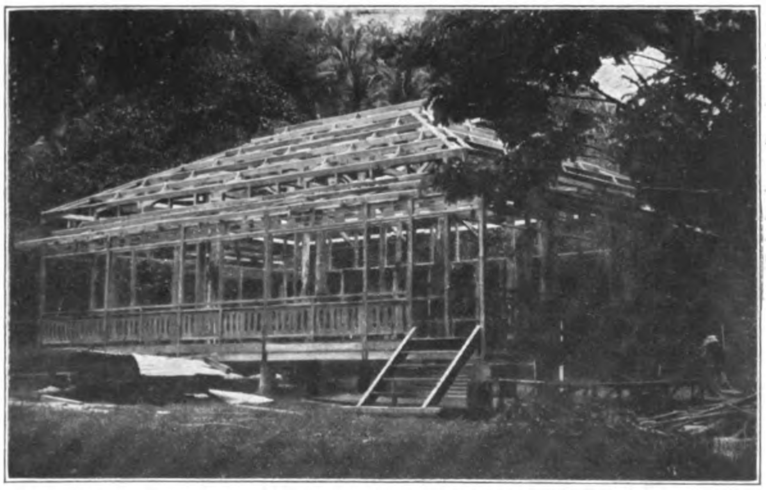
Camp One–Aringay Road, Province of La Union, 34 kilometers in length.—The Camp One-Damortis section, a distance of 16 kilometers has been completed and made a branch of the Benguet Road. The Benguet Automobile Line has transferred its station from Mangaldan to the Damortis Railroad Station, and began receiving passengers and freight from this station on November 1st. Since the opening of this road, the Damortis Railroad Station has been transformed from a simple flag station to one of the most important stations north of Manila. The finished subgrade from Damortis to the end of the first-class road at Aringay is now fairly passable for automobiles during the dry season.

Besides the foregoing road construction activities, fair progress was made during the year in the continuation of trail construction in the Department of Mindanao and Sulu.

Romblon High School Building. The added wing is at the left side of the picture, the roofing portion of which is white. Picture was taken below the grade line of the building.

BRIDGES.

While bridge construction has been somewhat curtailed during 1920 due to scarcity of materials in the local markets and to the shortage of funds, it has been possible, nevertheless, to erect several important structures.



Romblon Domestic Science building. Picture was taken below the grade line of the building.

Jones Bridge.—The work on this bridge is under the supervision of the Designing Division and is covered in the report of that Division, page 31.

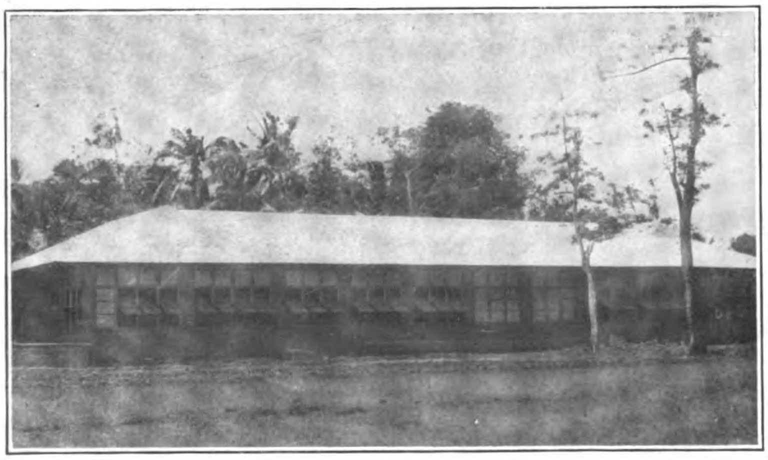
Bulacan Province.—The Bunsuran Bridge, a 70-foot timber Howe Truss on reinforced concrete abutments, open type, on the Bigaa–Pandi–Angat Road was completed at a total cost of ₱21,655.67.

The Hagonoy Bridge consisting of five 9-meter reinforced concrete slab and girder spans on pile bents is under construction. If suf-

Perspective view of Butuan Hospital, Province of Agusan.

ficient funds are made available, this bridge which will cost about ₱42,000, will be completed in 1921.

Cavite Province.—The construction of the Zapote Bridge, a 30-meter reinforced concrete arch located on the Manila–Bacoor Road, was begun in the latter part of the year. The excavation and form work for the north abutment of this bridge was practically completed by the close of the year. It is expected that concreting operations will be started sometime in January.



Back view of Botolan School building, Bureau of Education Plan No. 7, Botolan, Zambales.

All the concrete piles and truss members for the Imus Bridge, consisting of three 63.5-foot Wooden Howe Truss spans supported on reinforced concrete pile bents, were ready, and it is anticipated that the driving of piles will be started at an early date.

Cotabato Province.—A timber bridge crossing the Zarbang River, 50 meters long, supported on reinforced concrete pile bents and covered with galvanized iron roofing, was completed at a total cost of ₱11,426.58.

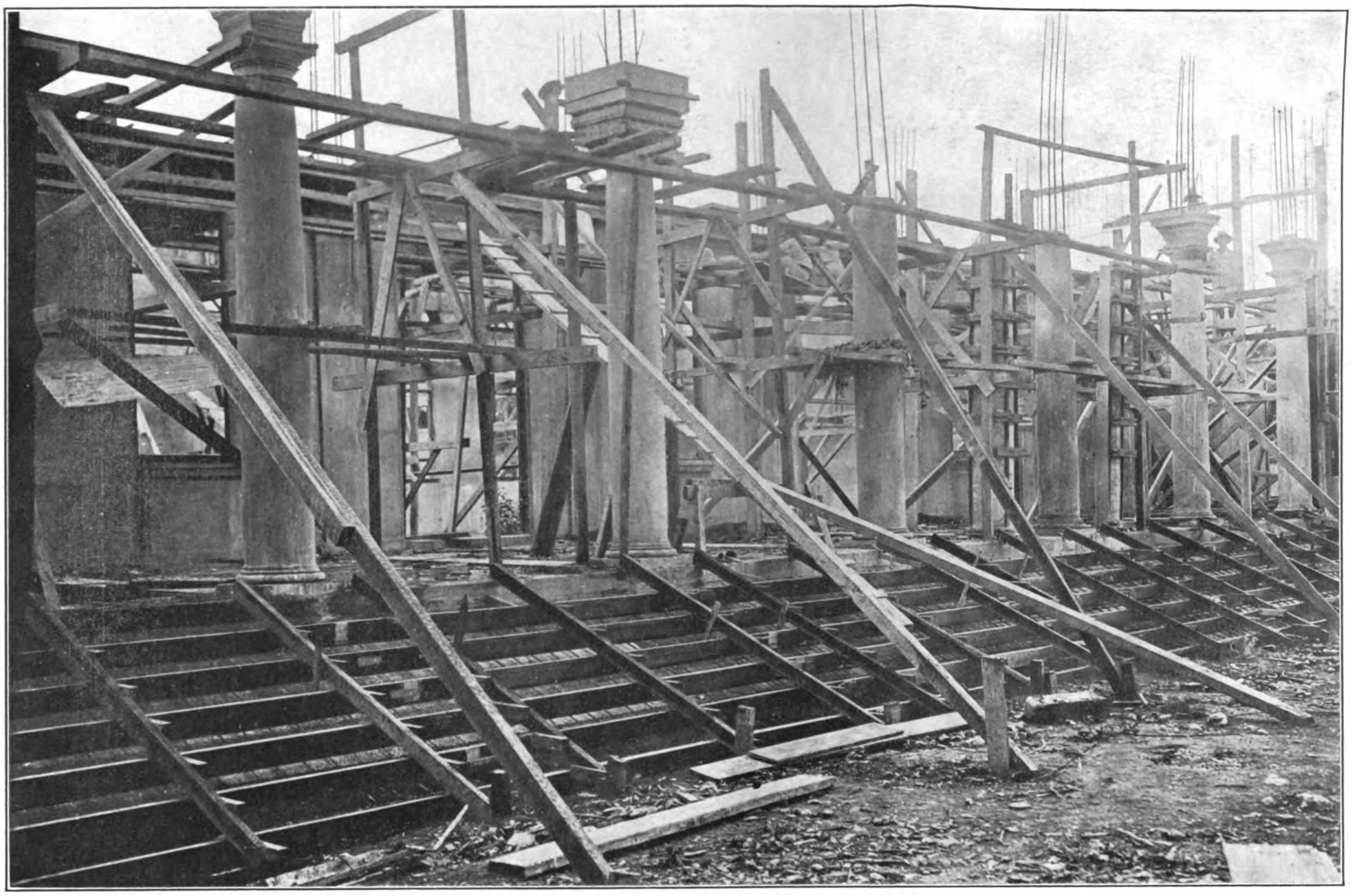
Mountain Province.—All materials were acquired and delivered during the latter part of the year to construct a 140-foot span suspension bridge over the Sabangan River. The estimated cost of this bridge is ₱12,200.

Rizal Province.—The Parañaque Bridge in the Manila–South Road, was completed by contract at a cost of ₱65,000. This bridge consists of eight 9-meter reinforced concrete slab and girder spans, supported on pile bents.

The contract for a bridge over the Mango River on the Pasig–Montalban Road, consisting of three 9-meter reinforced concrete slab and girder spans supported on two concrete piers and two abutments was awarded to Mr. John Gordon for ₱20,920. Work on same will start the early part of January, 1921.

Occidental Negros Province.—The bridge over the Binalbagan River was finished at a total cost of ₱98,336.31 and was opened to traffic on the first day of September, 1920. Part of the work was done by administration and part by contract. This structure consists of two 120-foot wooden Howe-truss spans supported on concrete piers and abutments.

Front view of Provincial Building of Isabela at Ilagan. The center part is the main building. First floor enlargement was completed about December, 1919. Only one-half of the second enlargement was made this year.



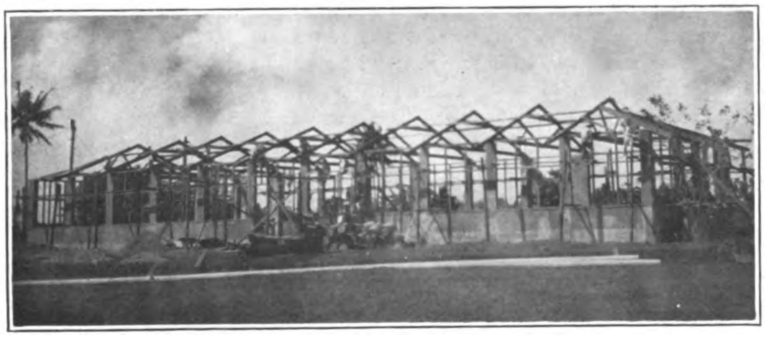
Dumaguete High School building, front colonnade, Oriental Negros.

Pangasinan Province.—A reinforced concrete slab and girder bridge over the Marusay River, consisting of nine 9-meter spans supported on pile bents, was completed in May at a total cost of ₱62,573.64.

Another reinforced slab and girder bridge over the Catablan River (five 9-meter spans) was started, but due to the delayed arrival of materials requisitioned, the bridge was only 68 per cent complete at the close of the fiscal year 1920. It is expected to open this bridge to traffic not later than March 1921.

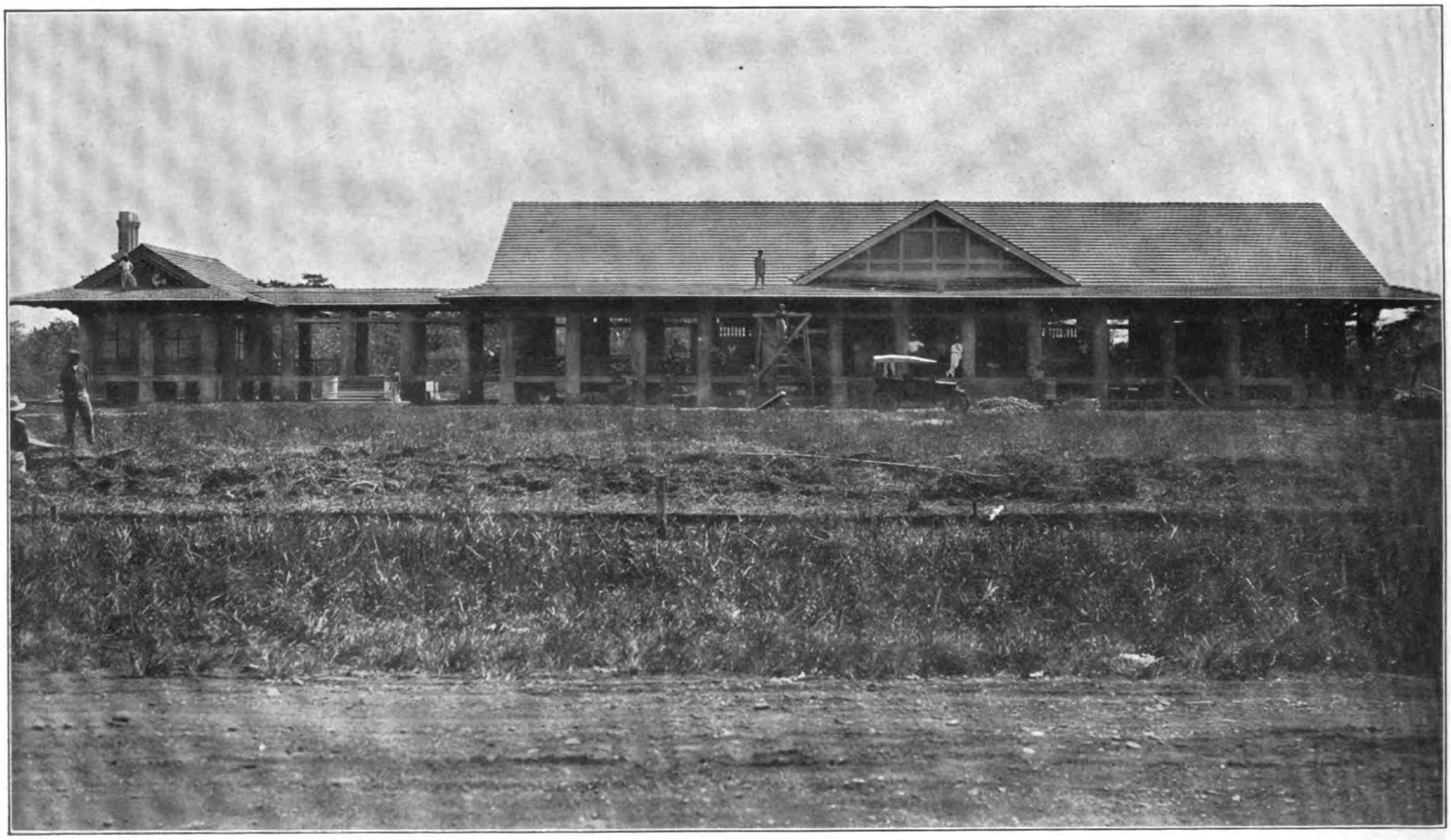
BUILDINGS.

Insular building construction at Manila during the year assumed proportions never before attained. While the universal prosperity of the Islands resulted in a tremendous increase in private buildings with consequent competition for the services of skilled artisans, it was, nevertheless, possible to carry on construction already underway and to undertake new work on a scale hitherto unknown. The Executive Building was sufficiently completed at the close of the year to permit occupancy of the first floor by the offices of His Excellency, the Governor-General, and it is estimated that 90 per cent of the entire work was completed, in spite of the fact that a full month was lost incident to the visit of the Congressional Party. All of the electric wiring for Malacañang grounds was put underground and greatly improved the appearance of the site.



Sorsogon Provincial Trade School, Sorsogon. Plan No. 8. Work completed in 15 working days.

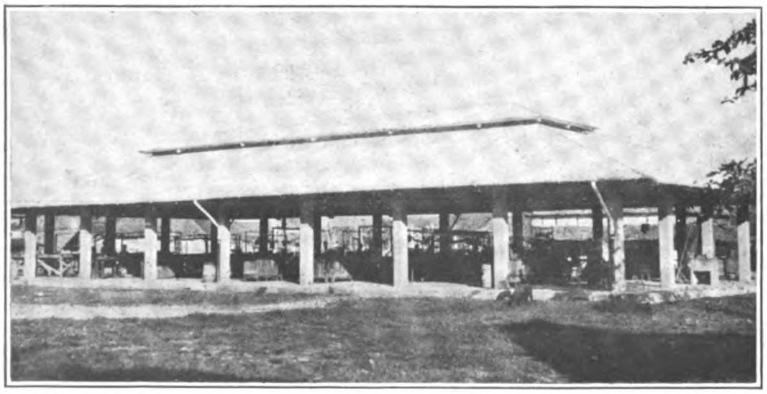
Bulan Presidencia, Sorsogon, nearing completion.



Davao Hospital, front view, showing main building and kitchen.

Owing to lack of equipment and personnel, work on the Insular Building, which will temporarily house the Legislature, could not be undertaken until late in the year. The foundations for this structure were completed by contract in 1919 and since no satisfactory bid was received, the remainder of the work had to be done by administration. As soon as the necessary equipment was available, construction was started and the progress made is considered very satisfactory, although it is not at once evident, owing to the size of this three and one-half million peso project. Mr. Lorenzo Vidad has been designated foreman on this job in addition to his work at Malacañang and Mr. Garretson has devoted practically all of his time to the supervision of both projects.

Excellent progress has been made on the construction of the new Nurses' Dormitory for the Philippine General Hospital. The form work on this job requires especially careful carpentry. The larger part of the procast ornamental work has been completed and delivered by the contractor. It is of interest to note that the hand mixed concrete on this job closely approximated laboratory quality when tested by the Bureau of Science.



Wright market, Wright, Samar.

Construction of Rizal Hall for the University of the Philippines was considerably retarded toward the close of the year by lack of funds, which necessitated reduction of the working force. The concrete, however, was sufficiently complete to permit erection of the steel roof trusses by the contractors, the Atlantic Gulf and Pacific Company, before the close of the year. This building which is architecturally a duplicate of University Hall is being constructed of reinforced concrete, with hard-wood finish throughout, and is estimated to cost ₱650,000. It was approximately 75 per cent complete at the close of the year.

The foundations for the new three million peso Custom House were satisfactorily completed by contract by Messrs. Tan Samco and the project now awaits further appropriation.

Approximately 4,000 piles, 12 meters long, will be required for the new Post Office Building. This work was let by contract to the Atlantic Gulf and Pacific Company and was approximately one-third completed at the close of the year. Numerous test loads have been applied to the driven piles on this job to determine whether splicing would be necessary. These tests have been carefully tabulated and studied, and have borne out fully the assumptions as to length of pile required, based on preliminary data secured at the inception of the project. Unless further tests show radically unexpected results, it appears probable that splicing will not have to be resorted to.

Construction of the addition to the Bureau of Printing was approximately 68 per cent complete at the close of the year.

Mr. E. A. Haley successfully completed his contract for erecting the new Dining Pavillion for the Philippine General Hospital and the foundations up to and including the first floor slab of the Maternity Pavillion and connecting corridor. This work was well done and the Dining Pavillion presents a very pleasing appearance. Electrical work was not included in his contract and was done by administration. Work was started on the foundations for the School for the Deaf and Blind at Pasay and on the addition to the Supreme Court Building in December.

The construction of the Butuan Hospital (a 13.50 m. × 38.10 m.

End view, Davao Hospital, showing operating room.

building), which constitutes one of the most magnificent improvements heretofore undertaken in the Province of Agusan, was completed in November with a total cost of ₱62,624.98.

The construction of the Laoag Normal School Building consisting of a 13.75 m. × 70.40 m. two-story main building and two one-story wings (12.17 m. × 23.18 m.), was 60 per cent complete at the end of the year. The two wings will be roofed with flat tiles made waterproof by laying underneath the tiles compound roofing substance laid on boards. This building, when completed, will be very impressive and will accommodate fourteen (14) classes exclusive of laboratory and library rooms. The total appropriation made available was ₱298,144.19, and at the end of the fiscal year 1920 the total expenditures had amounted to ₱272,696.30.

The construction of the Veterinary Science School Building for the University of the Philippines at Los Baños, Laguna, a 28.67 m. × 11.30 m. special design one-story reinforced concrete building, was completed on November 4, 1920, at a total cost of ₱28,177.51. In order to make this building ready for occupancy during the second semester, night work had to be resorted to.

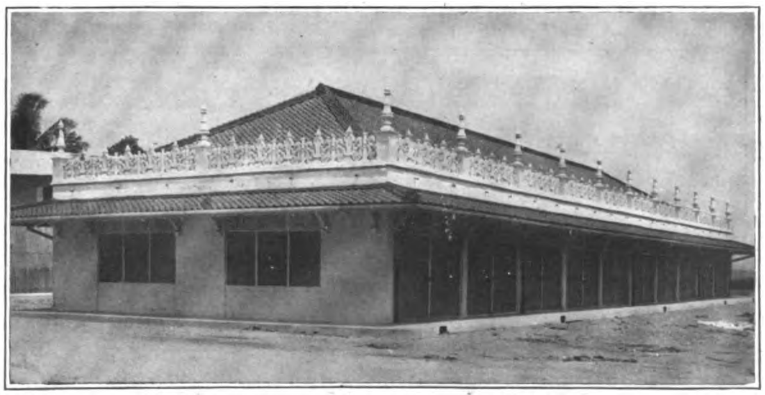
The high school Girls' Dormitory, a two-story reinforced concrete building of the Iloilo Type was started by administration at Lucena, Tayabas. As the work started late in the year, only 30 per cent of the building was finished at a total expenditure of ₱76,217.55.

On July 24, 1920, construction of the Iloilo Normal School was resumed with an additional appropriation of ₱76,315.00. It is being built opposite the Iloilo High School, on the other side of the main road from Iloilo to Jaro. The building will be a reinforced concrete structure highly ornamented and will have a galvanized iron roof. This two-story 196.4 m. × 15.6 m. building, containing an area of 2,805 sq. m. of floor space with a spacious laboratory and library at each end of the first story, when finished will be the most imposing school building in the Western Visayas.

Authority for the construction of a modern concrete structure with galvanized iron roof for the Constabulary Barracks at Davao, Davao, was granted during the second quarter of 1920. Work on this project was well underway, but due to lack of funds construction activity had to be temporarily suspended.

Materials for the construction of a Constabulary Barracks at Pasig, Rizal, were ordered and work was started the later part of October 1920. The building, which is of wooden construction and which is estimated to cost ₱41,800.00, is now 80 per cent complete and it is expected to be ready for occupancy sometime in February, 1921.

Materials for a high school building at Tuguegarao, Cagayan, Bureau of Education Standard Plan No. 20, Pasig Type, were requisitioned. ₱183,059.92 was made available in 1920 for this building and work will start immediately upon the arrival of the requisitioned materials.



Zamboanga market tiendas. Completed July 1, 1920.

Cagayan River Improvement, Aparri, Cagayan. Hurdle No. 8, with sheet piling 280-M and New Canal 390-M on the foreground, January, 1921.

The usual school, market, presidencia, hospital, and miscellaneous building construction was carried out in spite of the necessity for meeting the greatly increased cost of materials and at the close of 1920 a total of 82 permanent buildings were added to those in existence in previous years as classified below:

Class of buildings.	Number.
School buildings	47
Markets and tiendas	12
Presidencias	6
Hospitals	3
Miscellaneous	14
Total	82

WIRELESS STATIONS.

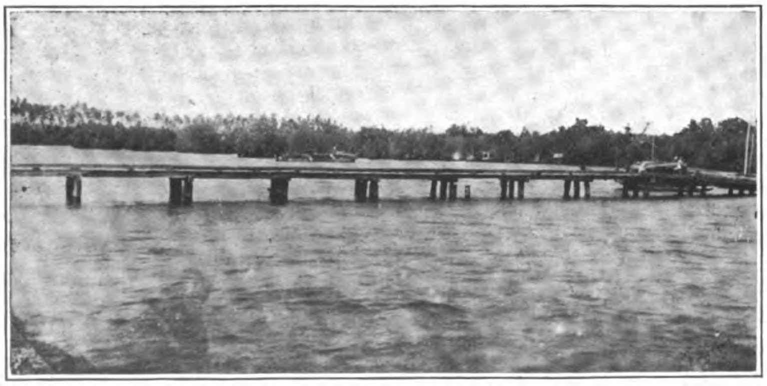
A constructing party of 23 men was detailed in the month of August to build the Basco Radio Tower and buildings on Batan Island.

The 200-foot Steel Tower and the Power House were completely finished, while the Operating House and the Store House were partially completed at the close of the year. As the work stands at present, the required machinery can be installed at any time.

The construction of a Power House, Operating House, two Employees' Quarters, two Store Houses and two 300-foot Steel Towers for the Batangas Wireless Station, was at the end of the year 90 per cent complete, and the station was sending and receiving messages in November.

The erection of two 100-foot wooden masts and the construction of one power house, one operating house and one employees' quarters for the Malita Radio Station at Davao, was completed in September, and in October this station was sending and receiving messages to and from the Davao Radio station.

The erection of a 200-foot steel tower, one operating house, one power house, one store house and one employees' quarters for the Iloilo Wireless Station, was completed in the early part of 1920 and the station was sending and receiving messages last June.



Cagayan Wharf Extension, Misamis Province.

The following table shows the status of the work on the towers and buildings for the other stations under construction:

Province and station.	Tower.		Buildings.	
	Type.	Remarks.	Units under construction.	Remarks.
Cebu:				
Mandawe	One 200-ft. galv. steel tower.	Completed	Operating house, power house, store house, and employees, quarters.	Completed, Started operating May 26, 1920.
San Francisco (Camotes Is.)	Two wooden 60-ft. masts.	do	One power house, one operating house, and employees' quarters.	Ninety-five per cent complete.
Cotabato:				
Port Labak	One 150-ft. galv. steel tower.	do	Operating house, power house, store house, and employees' quarters.	Sixty per cent complete.
Mindoro:				
San Jose	One 150-ft. galv. steel tower.	do	This station has been operating since 1919. During 1920 some minor repairs to the buildings were undertaken.	
Palawan:				
Balabac	One 150-ft. galv. steel tower.	do	Operating house, power house, store house, and employees' quarters.	Construction has not yet been started pending approval of additional ₱14,000 allotment.
Culion	One 150-ft. galv. steel tower.	do	Operating house, power house, store house, and employees' quarters.	Completed.
Puerto Princesa	One 150-ft. galv. steel tower.	do		Completed (old buildings repaired).
Sulu:				
Bongao	One 150-ft. galv. steel tower with 20-ft. mast.	do	Operating house and power house.	Under construction by contract.
Cagayan de Sulu	One 150-ft. galv. steel tower with 20-ft. mast.	do	Operating house and power house.	Construction was not started due to nonreceipt of materials. This is a contract project.

PORT WORKS.

Manila.—The most important port works activity of the Government is the construction of Pier No. 7 which is under the direct supervision of the Desinging Division and is reported on page 29 of this report. Other port works activities in Manila were confined to the maintenance of port works structures, Manila Harbor and the esteros. A portion of the South Break-water was repaired at a cost of approximately ₱12,000.00 and the Pasig River walls at Engineer Island and along the Muelle de la Industria were placed in good condition. Ornamental work on the Cargo Shed was finished, temporary wooden doors completed, roof trusses and roofing painted and 1,000 lineal feet of fender piles installed, the total expenditures being approximately ₱50,000.00. Considerable settlement of the fill for the Cargo Shed floor occurred and required extensive repair, the cost of which is included in the foregoing amount.

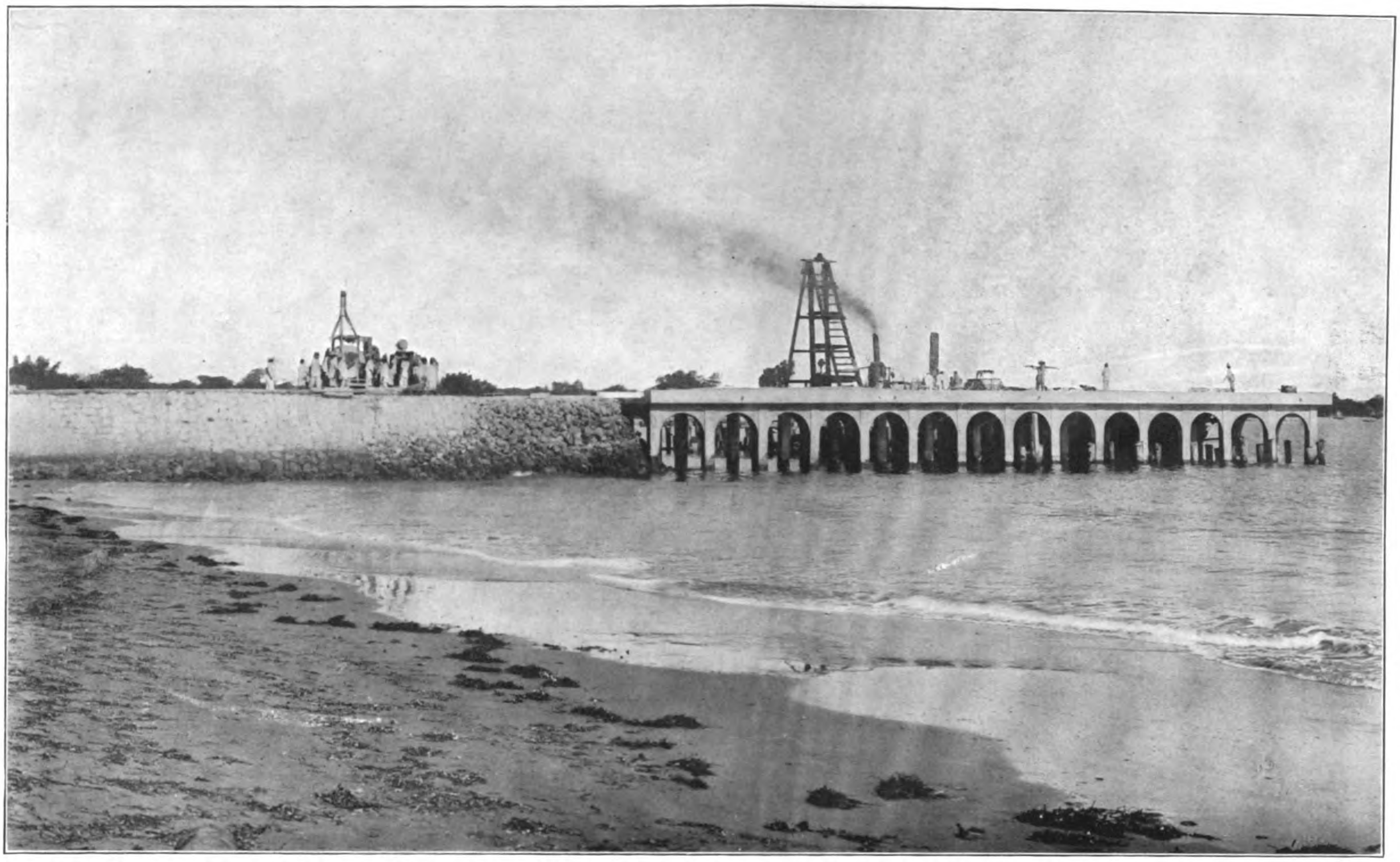
Approximately ₱200,000.00 were expended on the repair of Piers Nos. 3 and 5 during the year. A very considerable portion of this expense was met by owners of steamers causing damage to these structures. These funds, of course, accrue to the Insular Treasury and do not benefit this Bureau directly.

Agusan.—The work consisted in the cleaning of the channel of the upper reach of the Agusan River, such as the removal of the floating and submerged trunks of trees, which obstruct the free passage of launches and barotos.

The improvement and extension of the Butuan Wharf near the market building was started so late during the year that very little work was accomplished.

Bohol.—The construction of the Tagbilaran Port Works, which consists of 485 lineal meters of causeway and the deepening of the entrance channel by the removal of the coral reef encountered there, was continued during the year.

About 150 cubic meters of materials (consisting of sand, boulders and coral rocks), were excavated and 360 lineal meters of the causeway completed. This improvement when finished will enable interisland vessels to anchor directly at Tagbilaran as the minimum depth of the channel will then be 4.60 meters below mean level low water mark.



San Fernando Wharf, La Union, view showing completed portion.

Aparri.—The status of the work on the Cagayan River improvement at the end of the fiscal year 1920 was as follows:

Hurdle No. 8 at Aparri complete, hurdle No. 1 at Canayon 70 per cent complete, and hurdle No. 2 at Tallungan 40 per cent complete.

All the materials for the seashore protection at Aparri are ready and work will be started as soon as plans are approved by the Central Office and the monsoon changes from northeast to southwest.

Cebu.—The improvement and maintenance of the Port of Cebu was carried out as usual during the year at a total expenditure of ₱32,177.51. The work accomplished consisted of dredging, the reclamation of the land behind the bulkhead of the new wharf, and the resurfacing of the streets leading to the wharves.

Work on the construction and improvement of the Parian Estero consisted of lining up the sides and bottom of said estero with concrete, so that the water will flow with greater velocity than at present, which is very necessary as the said estero carries off a considerable part of the sewage of the city of Cebu.

Cotabato.—The only river improvement work accomplished during the year 1920 was the construction of the Lumupug-Bual Canal, 23 miles up the river from Cotabato. This canal was connected with an old Moro irrigation canal and by so doing it rendered a considerable area between Capimpilan and Lumupug cultivable by draining off the standing water which formerly had no outlet. Furthermore, it opened the way for small launches and vintas that travel through that district at high tide.

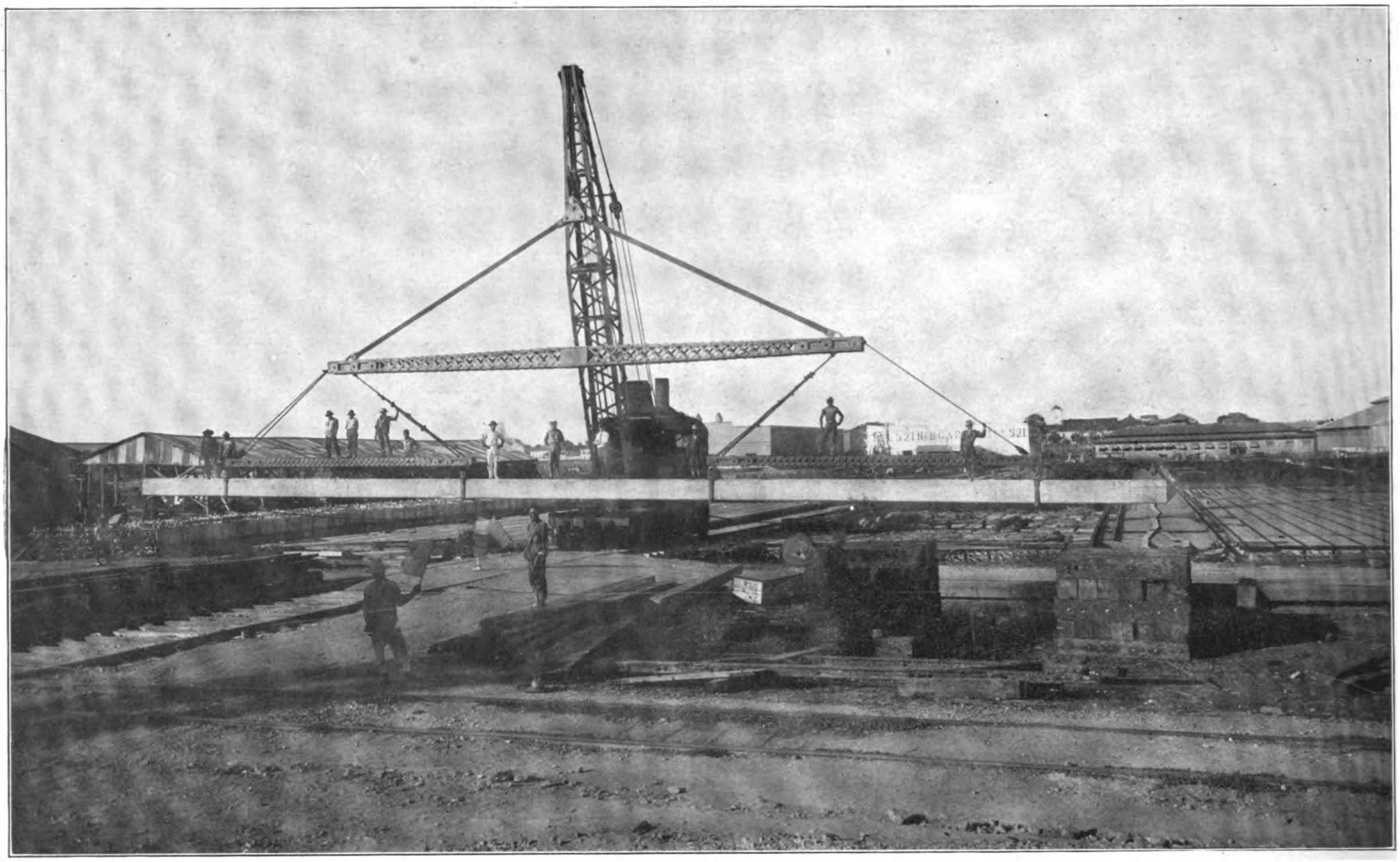
The reconstruction of the Glan Wharf was completed in July, 1920. At present any vessel drawing up to 40 feet of water can easily tie up at the dock, while before the completion of this project, goods were loaded and unloaded by boats, a very difficult undertaking in bad weather.

Lanao.—The work on the Iligan Wharf consisted of the construction of a 400-foot wooden pier (330 feet of which is 10 feet wide and the remaining 100 feet 20 feet wide), and a storehouse 33′ × 120′ of strong materials.

Iloilo.—The sum of ₱9,174.31 was made available for the maintenance of the port of Iloilo. The work done during the year consisted of backfilling behind the completed walls fronting the Custom House, general repair to equipment, and the construction of a floating pile driver.

La Union.—The San Fernando Wharf is a concrete structure of "L" shape. The superstructure of the wharf rests on concrete piles driven to a safe bearing power of no less than 30,000 kilos. This project was approximately 60 per cent complete at the end of the year.

Oriental Negros.—At Dumaguete two hundred sixty-five lineal meters of causeway, macadamized 5 meters wide on the top, and two temporary landing structures were completed during the fiscal year 1920. The completion of this causeway and the construction of the proposed 100-meter concrete pier will mean a great improvement in the handling of cargo and will eliminate the present rowboat and bamboo raft methods stevedoring.



General view of Pile Crane, Pier No. 7, Manila, P. I.

This view shows the Pile Crane steaming towards the Pile Scow carrying a 110-foot concrete pile.

Samar.—The proposed causeway at Catbalogan was extended to a depth of 8 feet of water at low tide. A depth of 18 feet is proposed, and this depth, if reached, will allow the largest vessels now visiting this port to moor alongside.

On the construction of the Calbayog Wharf ₱21,510.58 municipal funds were spent. The work on this project consisted of a concrete river wall which serves as a marginal wharf to small crafts and coastwise launches using the Calbayog River.

Sorsogon.—The status of the Gubat sea-wall at the close of the fiscal year 1920 was as follows:

Sixty lineal meters of the Gubat sea-wall were finished during 1920. It is hoped that the remaining 40 meters will be finished during the early part of 1921 if funds for same are made available.

Sulu.—The construction of the Jolo Wharf was, at the close of the fiscal year 1920, 70 per cent complete with a total expenditure of ₱50,524.29. The work consisted of repairs to the old timber dock, such as replacing the old teredo-eaten piles, caps and docking. There are on hand macaasim piles and lumber enough to complete the southwest half of the present dock. This part of the dock is in very bad shape, and it is imperative that repairs on same be made as soon as possible to save it from complete destruction.

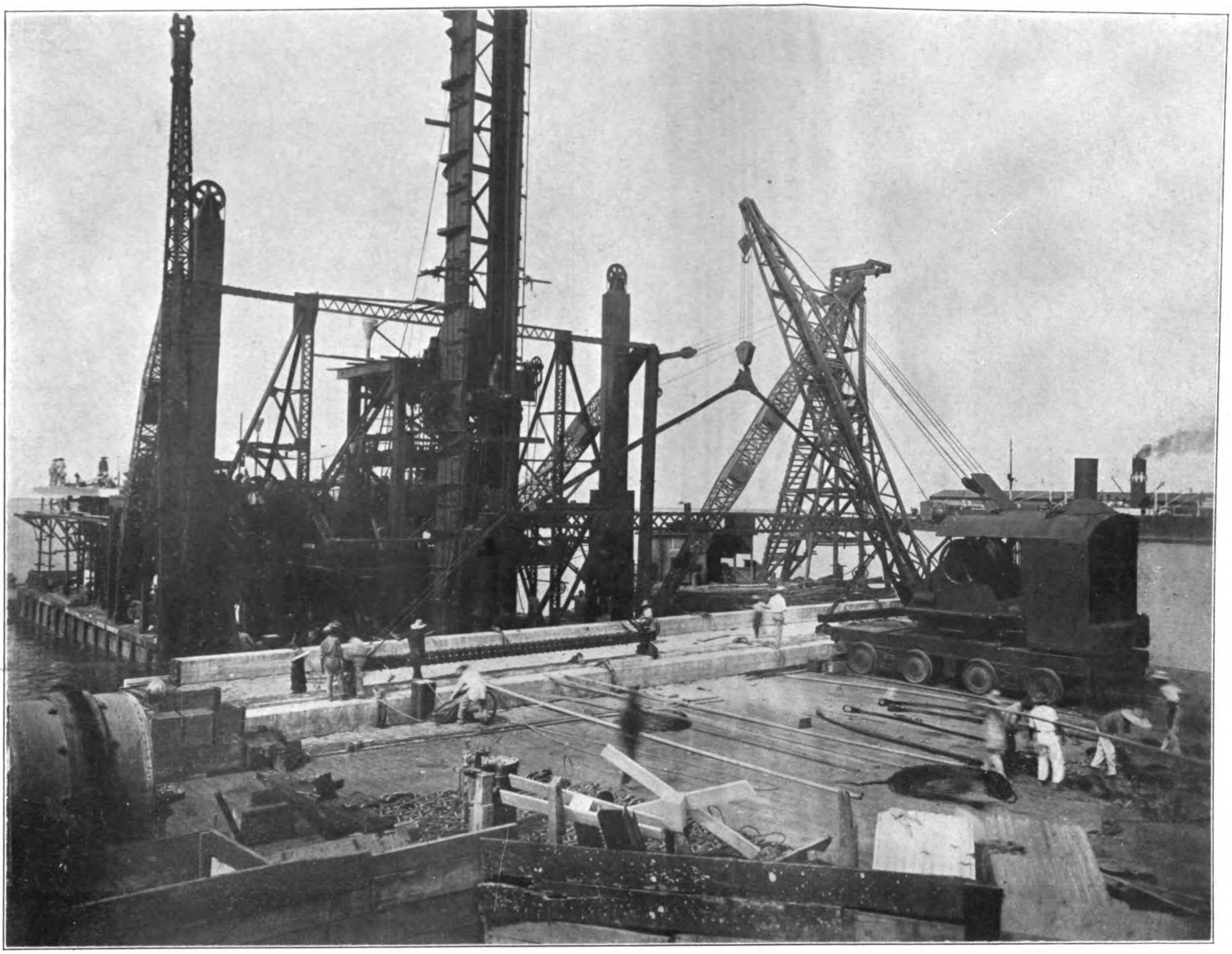
Zamboanga.—The Zamboanga Port Works improvements include the completion of the sea-wall now approximately 75 per cent complete, the filling of the area behind the wall, the extension of the present concrete wharf, and the replacing of the existing wooden wharf with a concrete structure. The principal work accomplished during 1920 consisted in the completion of 150 lineal meters of concrete wall in November, and rock backfill under contract awarded to Mr. C. V. Powers for the sum of ₱437 per meter for ordinary wall, ₱552 per meter for step section, and ₱3.80 per cubic meter for rock backfill. The plans for the wall provide for a gravity type on pile foundation having a dungon pile and spring fender system along its outer face. There are also step sections 12 meters long for small boat landings at regular intervals along the wall. The remaining 75 meters of concrete wall will be undertaken by administration as soon as settled weather can be assured which will probably be about the latter part of February. It is expected to complete the remaining piece of wall with the present available funds. Plans for a concrete pile fender system have recently been completed and galvanized reinforcing steel for these piles has been requisitioned.

At present the portworks facilities at Zamboanga are inadequate to meet the shipping needs. There is no port area where suitable bodegas and a new Custom House can be constructed. The area to be reclaimed behind the sea-wall now under construction will relieve this situation and the extension of the present wharf and dredging will provide adequate docking facilities for both inter-island and foreign boats.

DREDGING.

With the exception of a small amount of work which was done for the United States Naval Station at Cavite and the excavation of some 64,000 cubic meters of material at Cebu Harbor, dredging operations during the year have been confined to the usual maintenance of Manila Harbor and esteros.

A channel was dredged to the temporary Oil Depot of the United States Shipping Board in the South Harbor and the needs of foreign and domestic shipping provided for. The Dredge "America," which is under reconstruction at Cebu, would have been completed and put in commission before the close of the year but for the impossibility of securing certain necessary fabricated metal parts within a reasonable time. The need of modern dredges, scows and launches to replace the present antiquated equipment is urgent, and while the acquisition of a new seagoing tug and a fleet of wooden scows has been provided for, it is imperative that steps be taken to insure im-



General view of Bureau of Public Works Pile Driver "Mammoth" and Pile Crane, Pier No. 7, Manila, P. I.

This view shows the crane depositing a 24" x 24" x 110-foot concrete pile on the pile scow.

provement and maintenance of equipment for Manila and other ports throughout the Archipelago commensurate with their rapidly increasing commerce.

The following tabulation indicates the scope of the dredging work during the year 1920.

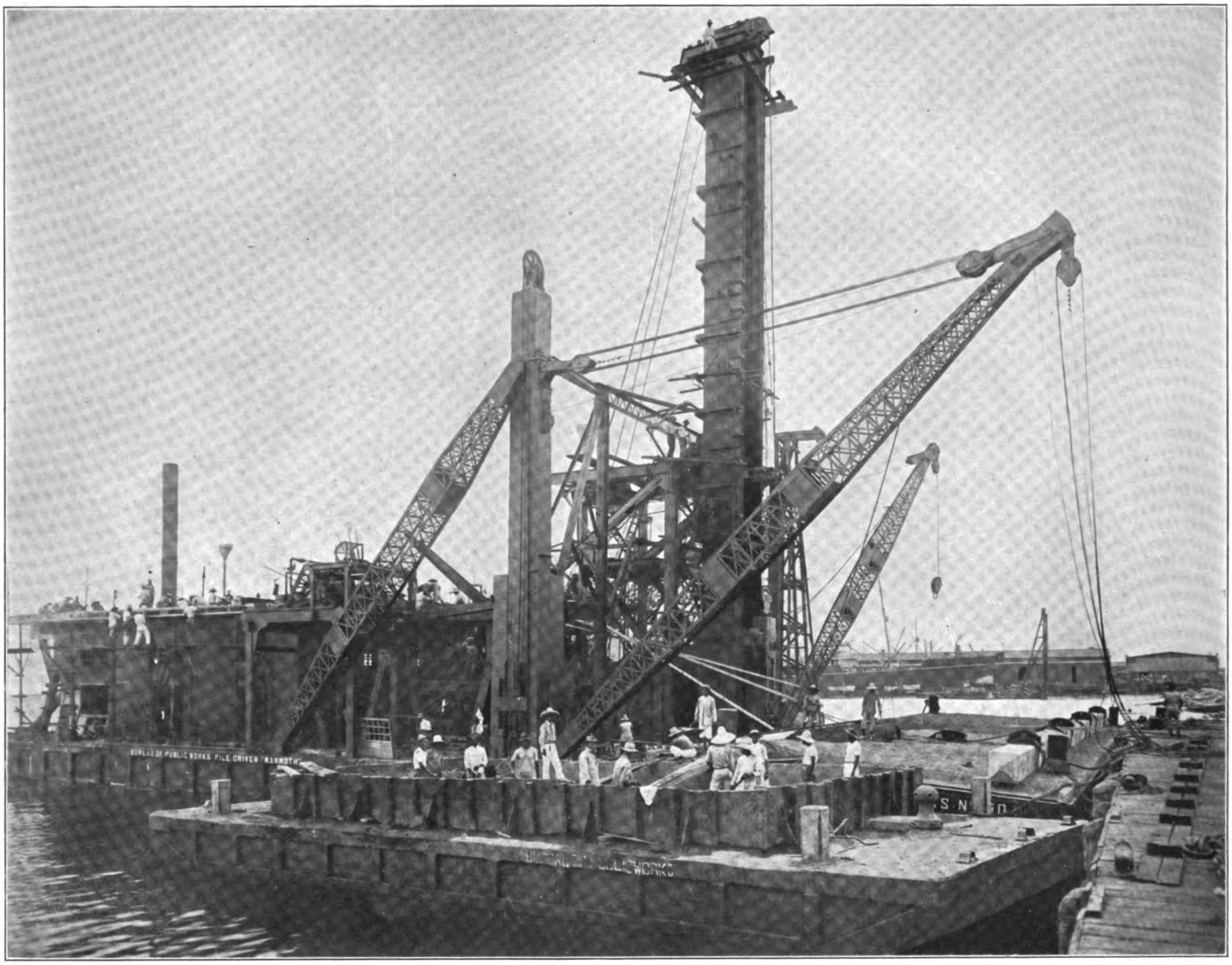
Location.	Total for 1920. *Cu. m.*
Lower Pasig	233,732.00
Outer Harbor	354,715.00
Upper Pasig River	260,093.00
Estero de la Reina	1,741.00
Paco Estero	7,537.00
San Miguel Estero	1,720.00
Outer Bar	16,126.00
Cebu Harbor	64,461.00
Balete Estero	2,975.00
Santibañes Estero	1,899.00
Earnshaw's Slipways	23,906.00
Los Baños Pier	2,149.00
Cañacao, Cavite	241,000.00
Total	1,312,051.00

LIGHTHOUSE CONSTRUCTION AND REPAIR.

During the fiscal year 1920, one standard sixth order lighthouse was constructed at Ambolon, Mindoro Province; two standard complete beacons at Bulan, Sorsogon, and at Maasin, Leyte; and four modified concrete beacons at Batan Port, Albay Province. Repairs on various lighthouses were also performed, viz: The Santiago, Malabrigo, Capul, Calantas, Bagacay, Tanguingue, Maniguing, Napindan, San Bernardino and Batag Lighthouses. The above lighthouses were

Lighthouses constructed during 1920.

Name of lighthouse.	Date commenced.	Date completed.	Nature of work done.	Expenditure.
Santiago	March 11, 1920	April 11, 1920	Repair of floors, doors, windows, etc.	₱2,141.40
Malabrigo	March 11, 1920	April 12, 1920	Repair of floors and gutters.	903.84
Capul	March 13, 1920	April 14, 1920	Repair of doors and windows.	594.03
Bagacay	March 15, 1920	April 16, 1920	Repair of doors and windows.	440.38
Tanguingue	March 17, 1920	April 18, 1920	Renewal of roof and repair of pipes.	7,652.05
Maniguing	April 16, 1920	May 23, 1920	Renewal of roof and repair of pipes.	2,606.59
Napindan	Nov. 24, 1920	Dec. 15, 1920	Repair of footing	1,186.97
San Bernardino	April 20, 1920	May 25, 1920	Renewal of roof and repair of pipes.	7,892.42
Batag	April 21, 1920	May 25, 1920	Renewal of roof and repair of pipes.	3,602.75
Ambolon	January 16, 1920	Nov. 30, 1920	Construction	20,322.66
Bulan	June 1, 1920	Dec. 15, 1920	Construction	5,769.42
Maasin	June 16, 1920	Dec. 13, 1920	Construction	10,482.31
Maasin	October 1, 1920	January 22, 1921	Construction	8,270.62
Total				66,572.08



General view of Pile Driver "Mammoth," Pier No. 7, Manila, P. I.

This view shows the pile driver's derricks in position ready to pick up a 110-foot concrete pile which is lying on the scow.

constructed and repaired by three construction parties of fifteen or thirty men each, according to the amount of work to be done.

The tabulation on page 19 shows the location, date commenced, date completed, nature of work done, and total expenditure of all work done during the fiscal year 1920.

TELEPHONE SYSTEM.

In Agusan, Mindanao, in addition to the maintenance of existing lines, 32 kilometers of new lines were installed at a cost of ₱5,159.32.

To the already established system of 246 kilometers of telephone lines in Bukidnon, Mindanao, the Diklom–Libona line of 12 kilometers was added.

In Davao, Mindanao, the Davao–Santa Cruz line was repaired. The Kingking–Pandasan line, 22 kilometers long, a portion of the Davao–North line, was reconstructed, and the extension of the Cuabo–Cateel line was finished up to Manay.

In Ilocos Sur, at the close of the fiscal year 1920, all municipalities with the exception of those in the interior were connected by telephone. The work was 90 per cent complete at a cost of ₱12,574.26.

The maintenance and extension of telephone lines in Nueva Vizcaya at an estimated cost of ₱12,057.65 was 90 per cent complete.

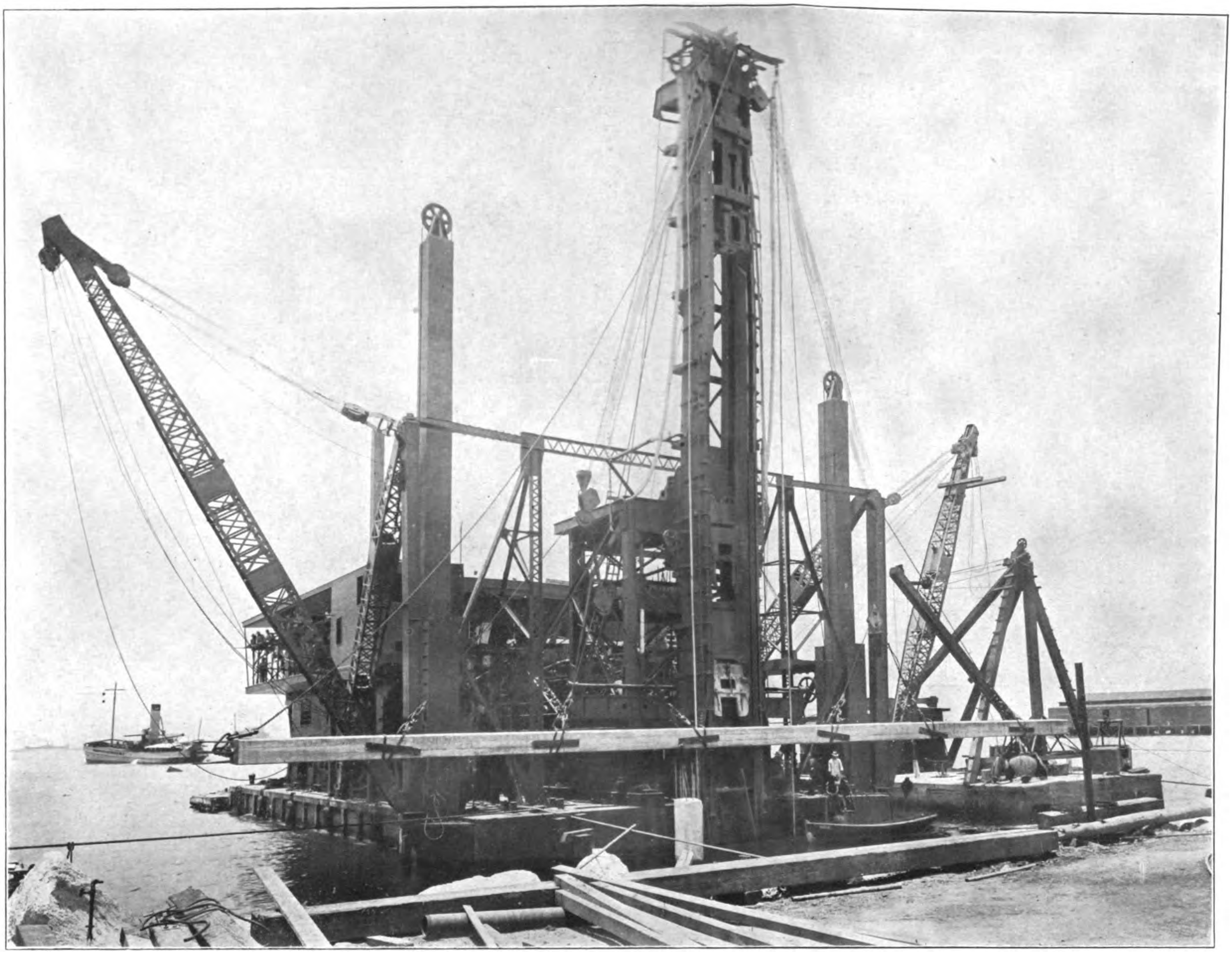
The reconstruction of the 4 kilometers of telephone line in Jolo, from Provincial Cattle Ranch to Bun-Bun on the Teak Reserve, was 80 per cent complete. The maintenance of the exising lines consisted in replacing old poles and keeping the line clear of brush.

DESIGNING DIVISION.

E. C. EARLE, *Chief Designing Engineer.*

In spite of the continued shortage of technical personnel in the Designing Division, it has been possible, due principally to the fine spirit of cooperation extant, to prepare plans for those projects most vital to commerce and industry, and to make studies, estimates, investigations, etc., including the preparation of reports and specifications covering a considerable number of bridge projects, pumping and power plants, light plants, wireless stations, light houses, tanks, buildings, and other miscellaneous structures as well as plans and specifications for floating equipment, such as dredges, pile drivers, scows, etc.

Plans and specifications were prepared during the year for five 150-foot steel and three timber wireless transmission towers—the first five being located at San Jose, Mindoro; Balabac, Palawan; Puerto Princesa, Palawan; Cagayan de Sulu, Mindanao; and Bungao,



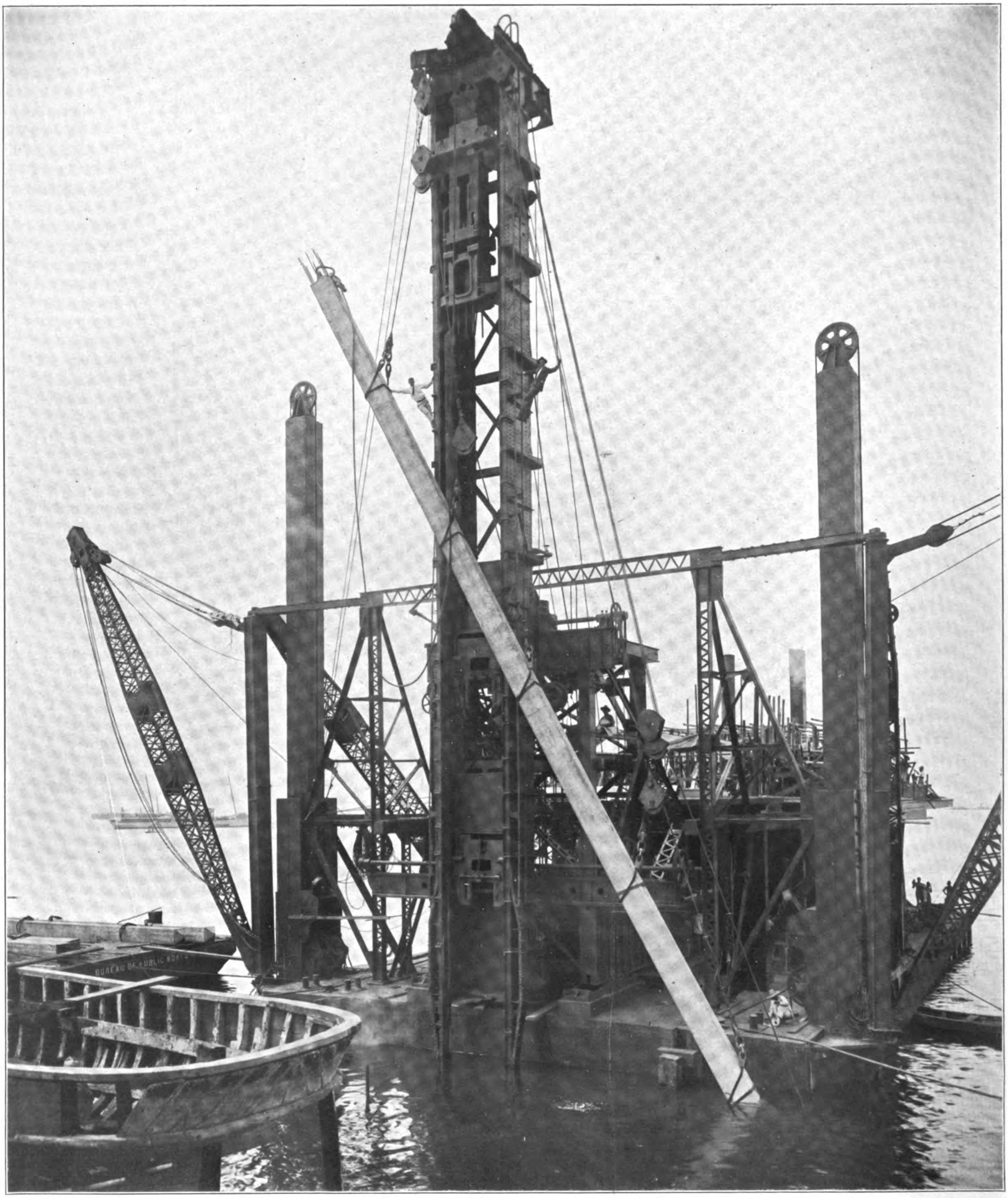
Front view of Pile Driver "Mammoth," Pier No. 7, Manila, P. I.

This view shows the 110-foot concrete pile already picked up by the pile driver's derricks.

Tawi-Tawi, respectively. The 100-foot timber wireless mast was designed for Makar, Mindanao; the 60-foot timber mast for San Francisco de Camotes, Cebu; and the 75-foot mast for Culion, Culion.

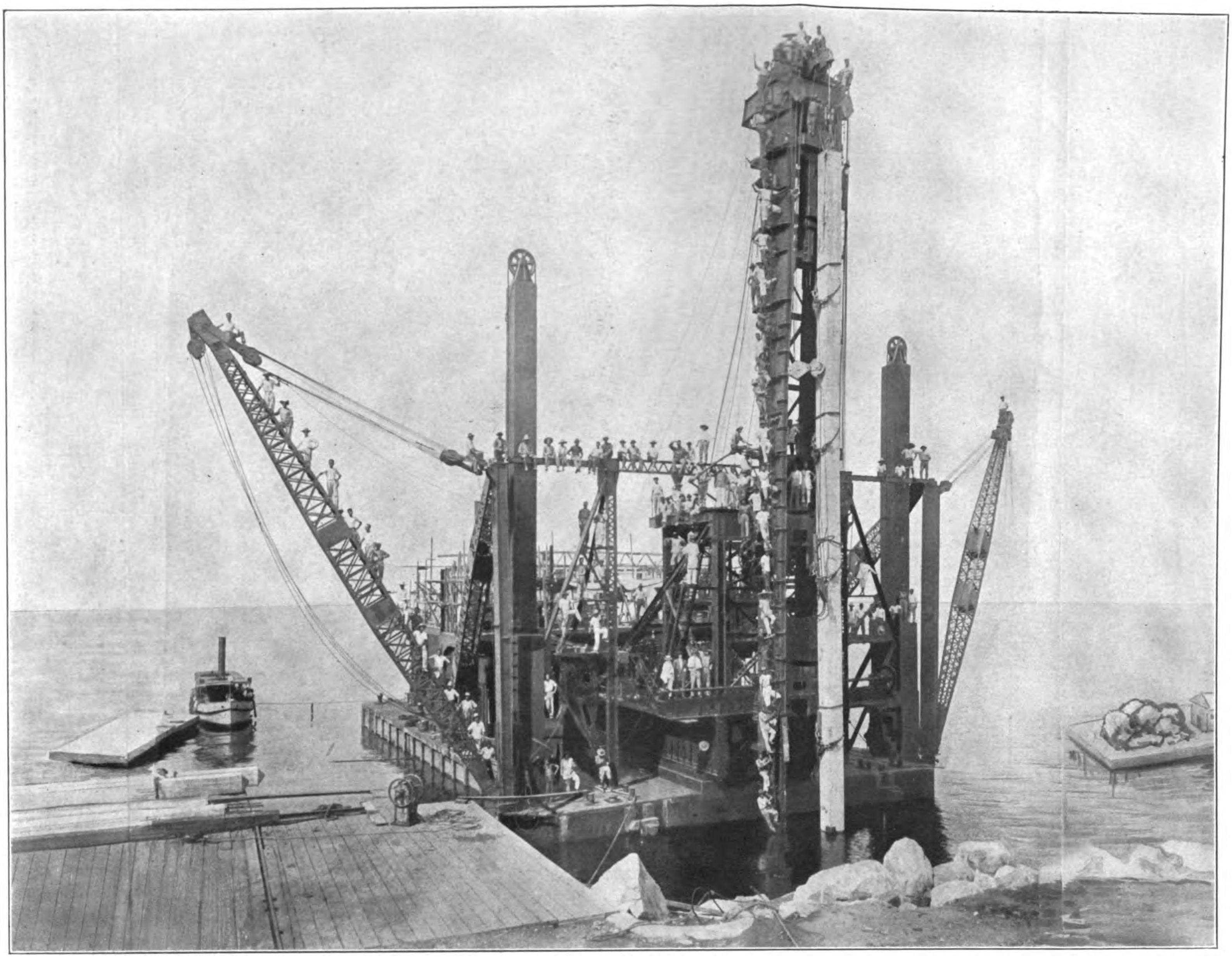
Plans and specifications were also prepared for the Papaya Creek Bridge, on the San Antonio road, Nueva Ecija; for the Dampalit River Bridge, on the Malabon–Obando road, Rizal; for the Hagonoy River Bridge, on the Santo Rosario–Hagonoy road, Bulacan; for the Jones Bridge (re-design and modification) Manila; for the Imus River Bridge, on the Binakayan–Kawit road, Cavite; for the Mango River Bridge, Montalban Junction, Rizal; for the Talaban–Diot Bridge, Himamaylan–Kabankalan road, Occidental Negros; for the Abacan River Overflow Bridge, on the Angeles-Mabalacat road, Pampanga; for a Foot Bridge at Engineer Island, Manila; for the repairs to the Yam River Bridge, Lucena–Tiaong road, Tayabas; for the repairs to Caong Bridge, Calaca–Balayan road, Batangas; for the Sisiman Matadero Pier, Sisiman Bay, Bataan; for the repairs to the New Washington Wharf, Capiz; for the San Fernando Wharf, San Fernando, La Union; for the Jolo Wharf, Jolo; for the Malacañang Palace River Wall, Manila; for the Cotabato Light House Tower, Cotabato, Mindanao; for the refrigerating room, serum laboratory, Alabang, Rizal; for the structural details of the superstructure of Pier No. 7, Manila; for the Cargo Shed Steel Rolling Doors, Manila; for a 16-inch dredge pump for the steamship *Dredger*, Manila; for one 1,000-ton pile driver hull; for three 400-ton scows, eight 100-ton, three 150-ton and six scows of smaller capacity; for a concrete oil tank, Insular Mint, Manila; for a 56-foot steel pile driver, and for numerous other miscellaneous structures and pieces of floating and land equipment of more or less importance, such as guy derrick, hand power derrick, pile plant extension equipment, lifting and testing beams, etc.

Plans, specifications and bills of materials were also prepared for the electrical installations in Rizal Hall, University of the Philippines, Manila; Nurses' Home, Philippine General Hospital, Manila; Maternity Ward, Philippine General Hospital, Manila; Executive Building, Malacañang Palace, Manila; addition to Supreme Court, Manila; School for Deaf and Blind, Manila; Engineering Laboratory, University of the Philippines, Manila; Chemical Laboratory, University of the Philippines, Manila; Insular Building, Manila; Trade School, Manila; Post Office, Manila, as well as for the Normal School, Iloilo, Iloilo; Normal School, Cabanatuan, Nueva Ecija; Normal School, Tuguegarao, Cagayan; High School, Tarlac, Tarlac; Presidencia Building, Batangas, Batangas; Girls' Dormitory, Lucena, Tayabas; Provincial Building, Cabanatuan, Nueva Ecija; and Zamboanga Normal School, Zamboanga, Zamboanga.



Front view of Pile Driver "Mammoth" in operation, Pier No. 7, Manila, P. I.

This view shows a 110-foot concrete pile being slung into position. It will be noted that the steam hammer has already been raised and is flush with the leads to the top.



Bird's-eye view of Pile Driver "Mammoth," Pier No. 7, Manila, P. I.

This view shows the pile already slung into place—sling not yet removed. An idea of the size of the driver and pile is easily obtained by noting the men thereon.

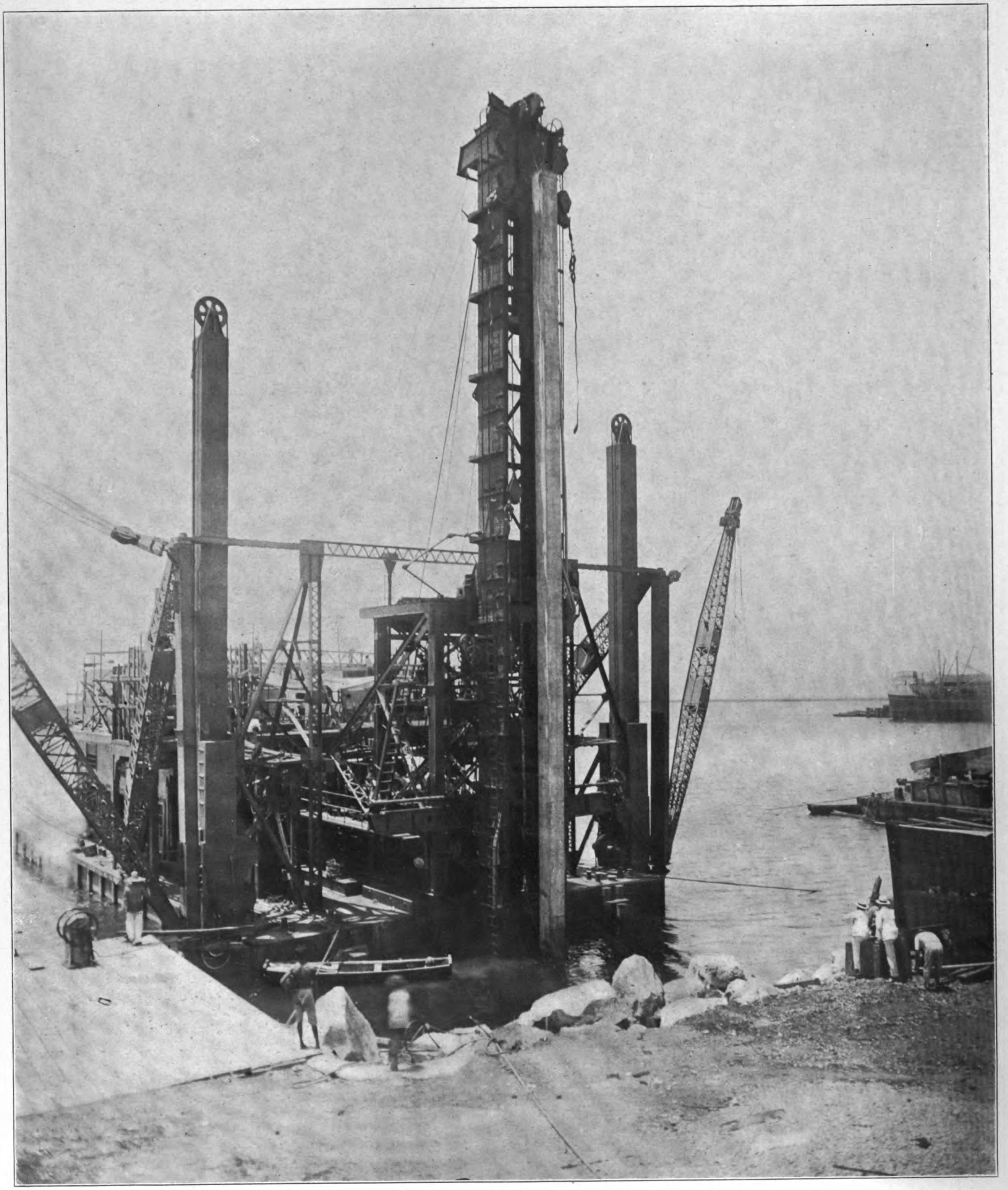
Investigations, reports and recommendations in considerable number, were also made in connection with the gas electric plants to be located at Sibul Springs, Bulacan; Lingayen, Pangasinan; Batangas, Batangas; Taal, Batangas; Honda, Cebu; Naic, Cavite; and for the hydro-electric plants located at Baguio, Benguet; and Duero, Bohol. A considerable amount of work was undertaken in connection with the pumping plants at Batangas, Batangas; Lipa, Batangas; and Pagsanjan, Laguna.

Investigations looking to the standardization of motorcycles, automobiles and trucks, were conducted during the year and a study made of auto traffic conditions which led to the preparation of a new set or regulations to govern auto traffic throughout the Islands.

A study was also made of mail handling conditions at Manila, with a view to equipping the new Central Post Office with the most modern equipment for the rapid handling of mails. The tentative plans provide for the handling of the incoming mails, both from river launches and trucks, by a system of belt conveyors which deliver the sack mail directly to the sorting center. From this center to the various other distributing sections, such as the city delivery section, city carrier section, registered mail section, box section, etc., a conveniently located overhead conveying system has been provided for, both of the trolley and pneumatic types. Pneumatic tubes will be provided between the telegraph sections and the various other important centers for the transmission of telegrams and other important correspondence from these sections to the sending sections or to the recording section.

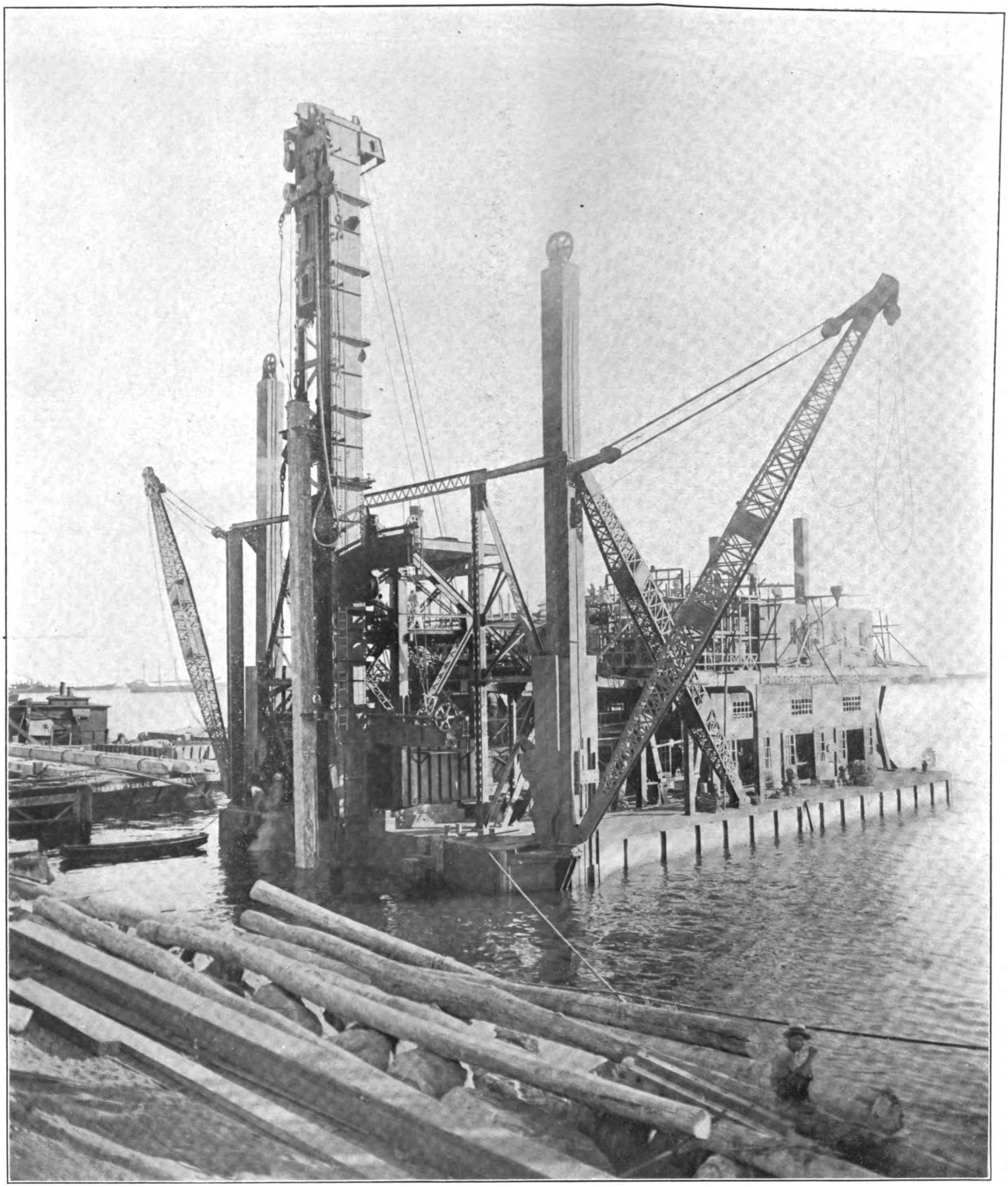
An extensive study was made by this division of the proposed National Cement Plant to be established at Naga, Cebu, under the management of Mr. C. F. Massey of Chicago, in connection with the National Development Company. The entire development was analyzed, proposed methods of manufacturing gone into, and recommendations made both as regards the feasibility of manufacturing cement economically with the proposed plant (wet process) and as regards the proposed financing of same.

The Insular Quarry at Los Baños was re-arranged and equipped with modern crushers, conveyors, screens and additional storage facilities. A new quarry face was opened and a 40-kilowatt electric generator driven by a Fairbanks-Morse crude oil engine installed to furnish current for the electric shovel which was commissioned in April. Two other crude oil engines of the Fairbanks-Morse "Y" type, were installed to drive the extra battery of crushers, elevators, screens, etc. A Chicago Pneumatic Tool Company's crude oil com-



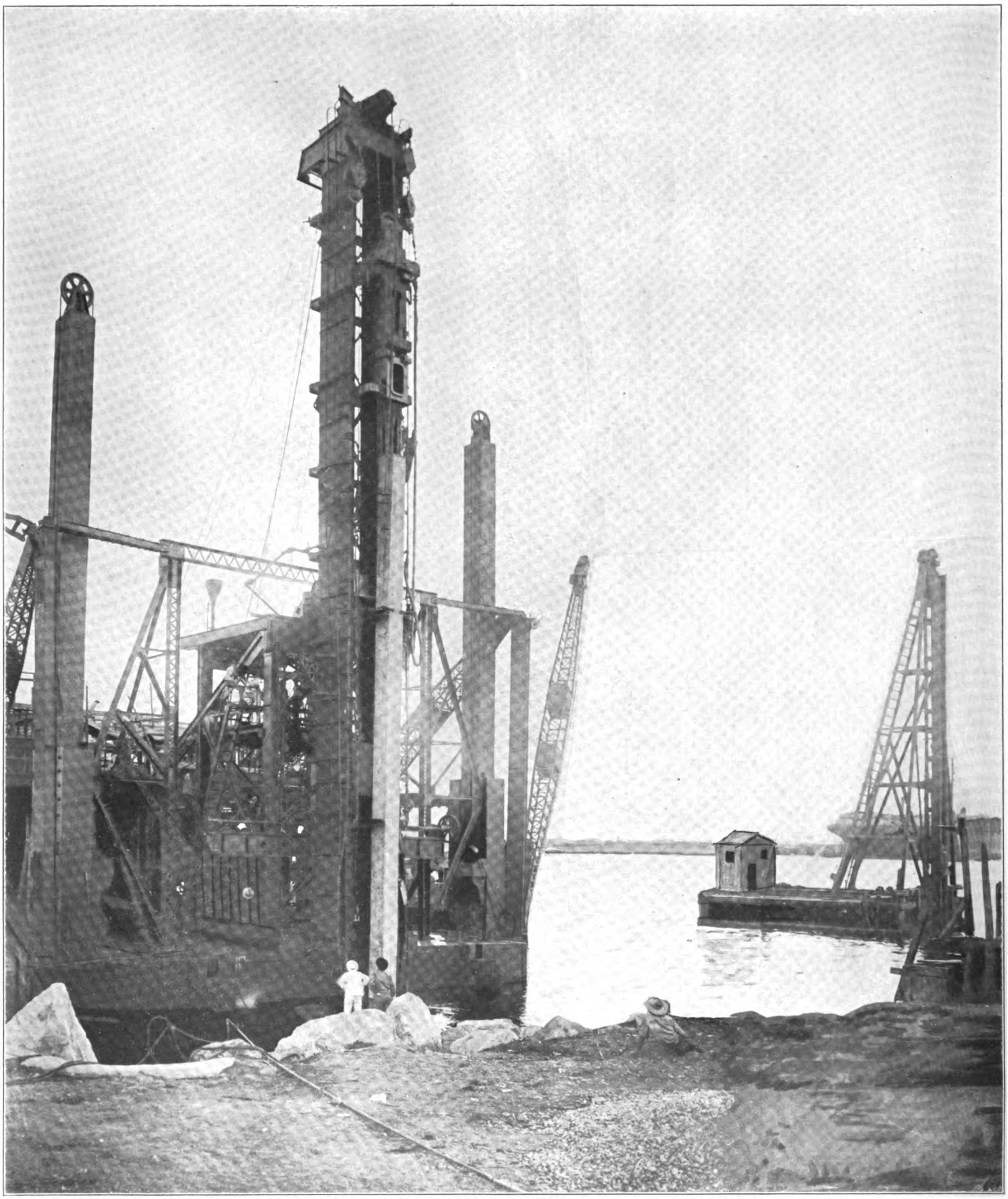
Front view of Pile Driver "Mammoth" in operation, Pier No. 7, Manila, P. I.

This view shows slings removed from pile. The pile is now ready to be driven.



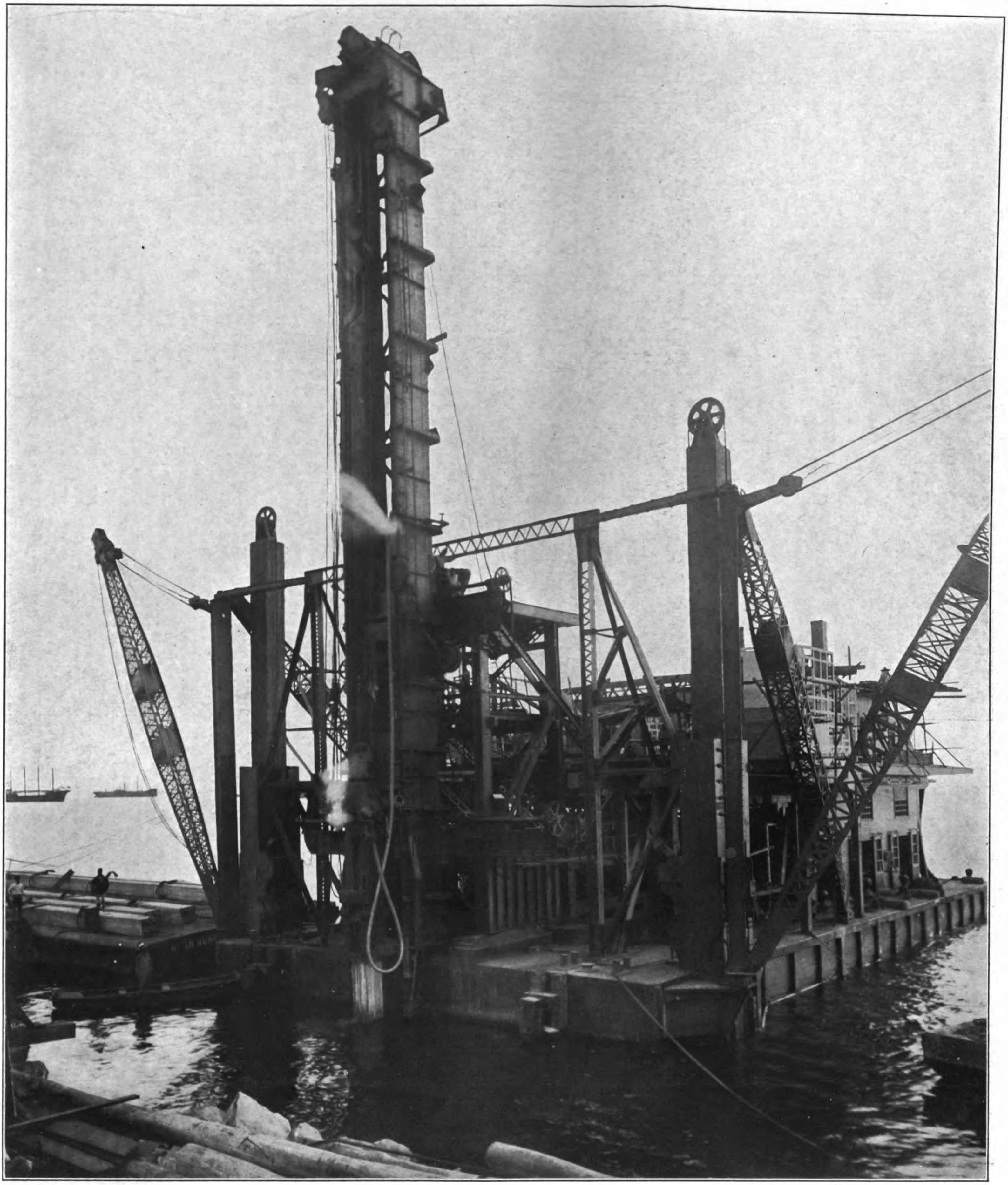
Front view of Pile Driver "Mammoth" in operation, Pier No. 7, Manila, P. I.

This view shows pile in position of rest. It also shows the guiding fingers very plainly.



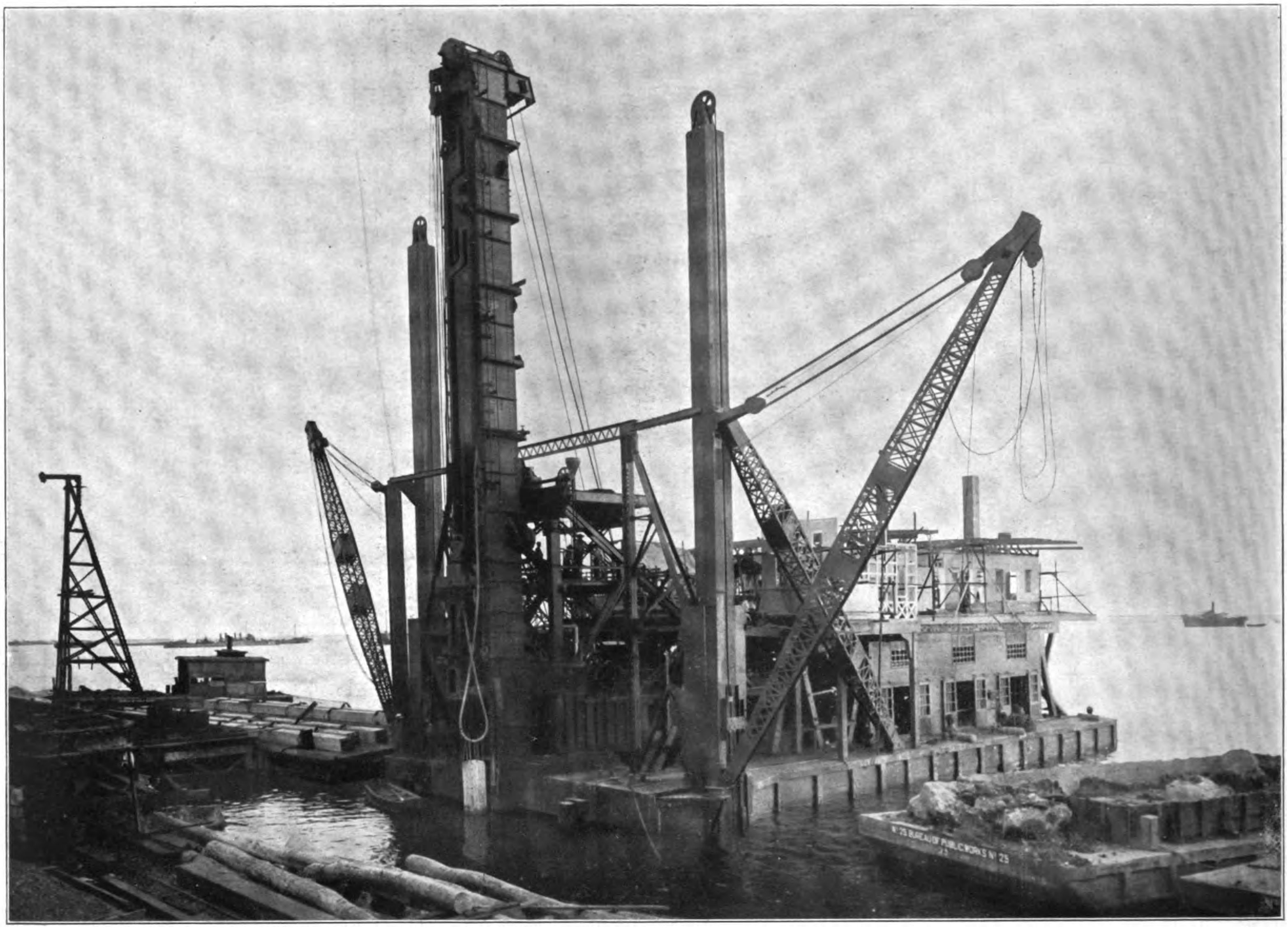
Front view of Pile Driver "Mammoth" in operation, Pier No. 7, Manila, P. I.

This view shows the guiding fingers in a lowered position and the steam hammer in its forward position ready to descend onto the pile head for driving.



Front view of Pile Driver "Mammoth" in operation, Pier No. 7, Manila, P. I.

This view shows the first pile completely driven and the steam hammer in operation.



General view of Pile Driver "Mammoth" in operation, Pier No. 7, Manila, P. I.

This view shows the driver and hammer hoisted just above the pile after completing driving.

pressor was also installed and has been in operation for some time, furnishing air to the rock drills which have superseded the old hand drilling system at this quarry—thus saving considerable sums of money which were spent for drilling prior to the inauguration of this service. A gravity loop system for handling the material cars between the quarry face and the battery of crushers was practically completed. A preliminary layout was made for a combination hydro-electric and water supply project which will greatly reduce operating costs at the quarry and at the same time provide the town of Los Baños with excellent drinking water and electric lights.

A large quantity of additional machinery was purchased and installed in the Bureau's Machine Shops, under the supervision of the Designing Division, thus placing the bureau's shop in a more efficient position to handle all shop work necessary for the proper maintenance and operation of its equipment.

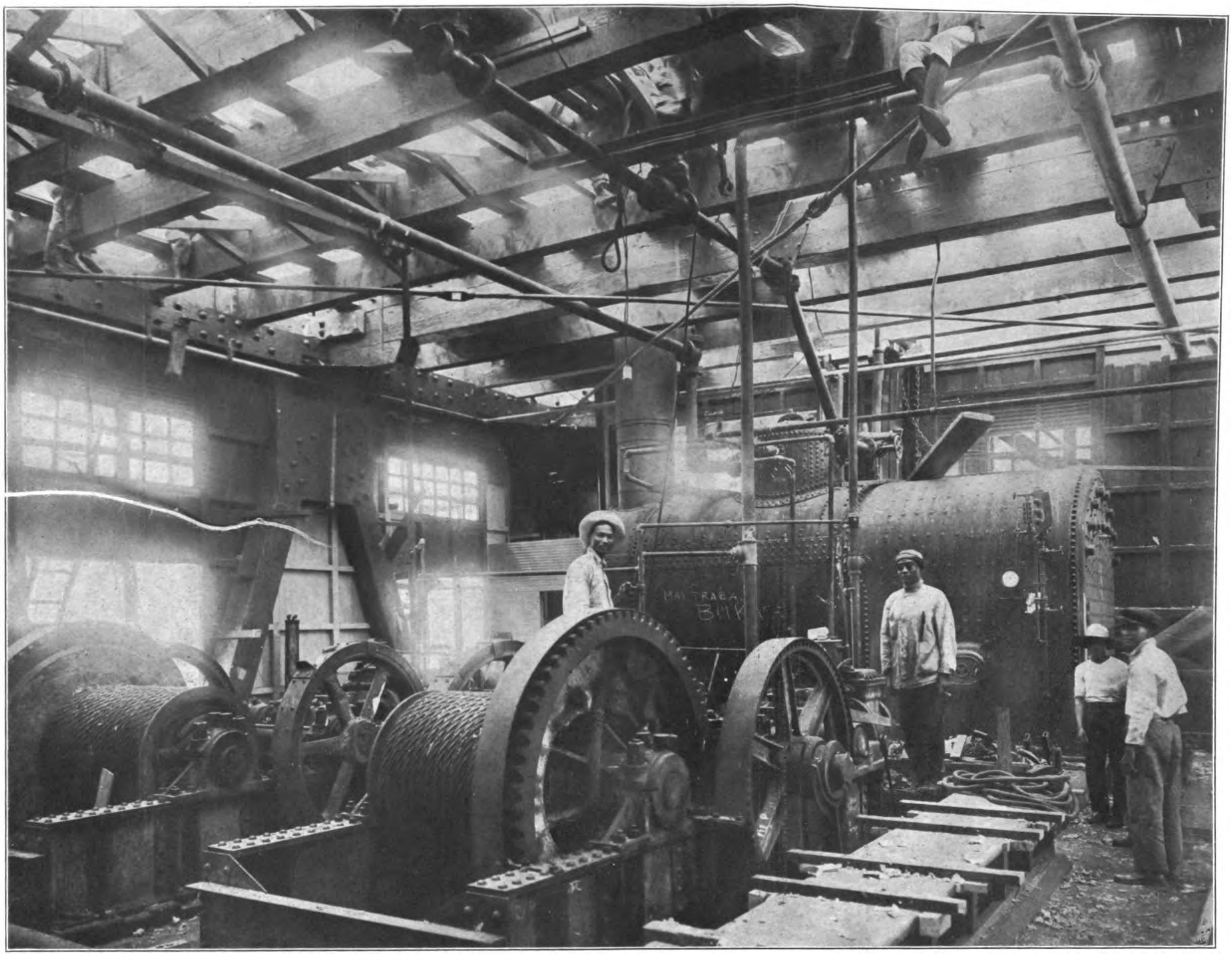
A considerable quantity of miscellaneous machinery for use in connection with the construction of the numerous public buildings throughout the Islands—such as floor surfacers, pneumatic tools for surfacing the exterior surface of buildings, small saw mill plants for efficiently handling and shipping the materials to be utilized in the manufacture of doors, windows, furniture, etc., were also installed.

A number of air compressors, manufactured by the Chicago Pneumatic Tool Company, were erected and operators were trained to operate same, under the supervision of the Designing Division. Three of these machines are in operation at Pier No. 7, one at Bangar, La Union, and a fifth at Malacañang Palace, Manila. These compressors furnish air, at a very low cost, for the operation of the various types of pneumatic tools, consisting of steel chipping hammers, caulking hammers, powerful wood boring engines, wall surfacing tools, small pneumatic hoists, grinding tools, etc.

A car incline, including a hoisting winch and turn-table, etc., was put into operation in connection with the new pile casting plant at Pier No. 7.

An exploration party was sent out to explore the Military reservation in the vicinity of Patungan, Cavite, with a view to establishing a suitable hard rock quarry. A number of cores were drilled from the rock, both within and without the Military reservation, however a suitable hard rock quarry site has not as yet been found. A semi-hard rock quarry site located at Sisiman on the Military reservation was negotiated for and a permit was granted by the Army authorities for the establishment of an Insular quarry at this site by this bureau. The entire plant equipment for the quarry, including derricks, engines, drilling apparatus, stone cars, crushers, etc., has been purchased and a general layout prepared with a view to undertaking active work on this quarry during the early part of 1921. This rock will be utilized, mostly, for port works construction at Manila.

An inspection and investigation was made in connection with the proposed sale of the Mambulao Gold Dredge to this bureau, with a view to converting it into a combination ladder and hydraulic



Interior view of Pile Driver "Mammoth," Pier No. 7, Manila, P. I.

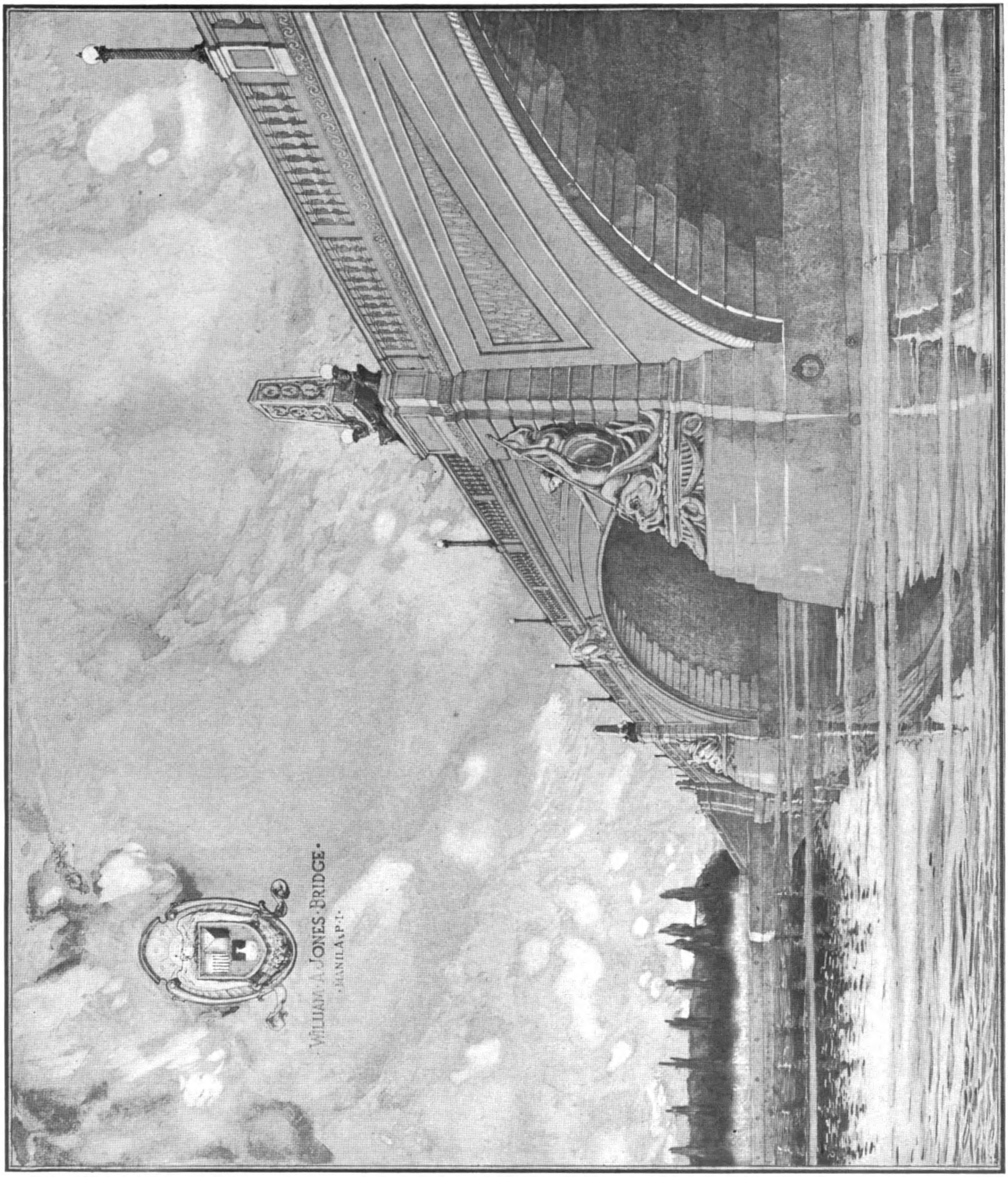
This view shows the boiler room and two forward spud engines.

dredge, to be utilized in dredging the Manila harbor. Negotiations covering this matter were dropped, however, after it was finally decided that the construction of a new dredge would be more advantageous to the government.

The year 1920 was especially gratifying as regards the work accomplished in connection with port improvements throughout the archipelago—the month of April marking the inauguration of the greatest port works program ever launched in the history of the Islands, due principally to the flotation of a ₱10,000,000 bond issue in the United States. The availability of these funds, together with other funds voted by the Legislature, placed the Bureau in a position to proceed with the preparation of the plans for the various harbor improvements throughout the Islands and considerable work was accomplished by the Designing Division in this direction as regards plans for the Port of Manila and numerous other provincial ports.

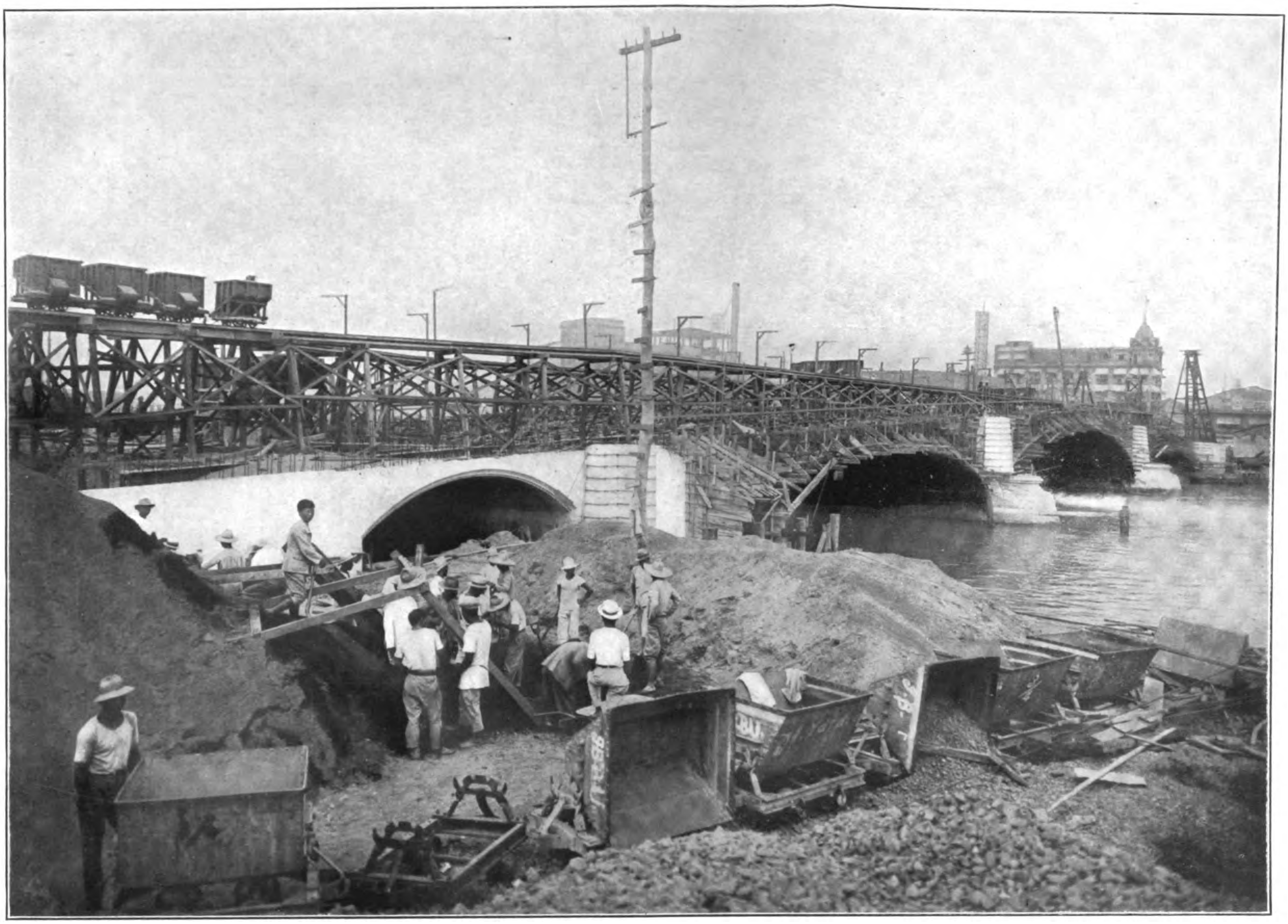
Standing foremost among the port projects, for which designs have been prepared, are the Manila Harbor improvements, embracing both the South and the North Port Districts. During the year, the Designing Division developed plans for the Port District to the north of the Pasig River (known as the North Port District) which will involve an expenditure of approximately ₱90,000,000 for carrying the project to completion. Port facilities in the South Port District, which will soon be realized, bid fair to place Manila among the leading ports of the world, in so far as the handling of cargo is concerned.

The improvements mentioned above, include plans for the extension of the break-water in the South District, for the closing of the gap and for the opening of a channel at the south end of the existing south break-water; for the opening of a channel into the Pasig River as well as the details for the superstructure of Pier No. 7. Very gratifying progress was made in connection with the design and construction of the steel Pile-Driver *Mammoth*, which is the largest and most modern pile-driver ever constructed anywhere (see photographs) either locally or in the United States. The 1,000-ton hull for this fine piece of equipment was launched late in November. This machine will be utilized in driving the 24-inch x 24-inch x 110-foot substructure reinforced concrete piles for Pier No. 7. Its possession forms a most valuable addition to the Bureau's equipment, and places the Bureau in an independent position as regards its ability to construct marine terminal structures of the most modern type. Henceforth, it will be available, for the construction of piers, wharves and sea-walls throughout the Archipelago—enabling designs to be executed which were heretofore impossible due to the lack of suitable equipment. The pile-driver will be commissioned and commence driving piles in March 1921.



Perspective view of the Jones Bridge, Manila, P. I.

The architectural features of this bridge were designed by Messrs. W. E. Parsons, Geo. C. Fenhagen and R. H. Doane, and the details were drawn by E. L. Bachman, Fernando Soriano and others, of the Bureau of Public Works. The structural features were designed by Messrs. G. W. Mayo and Federico Muños, of the City Engineer's office, and by Messrs. E. C. Earle and J. Vallarta, of the Bureau of Public Works.

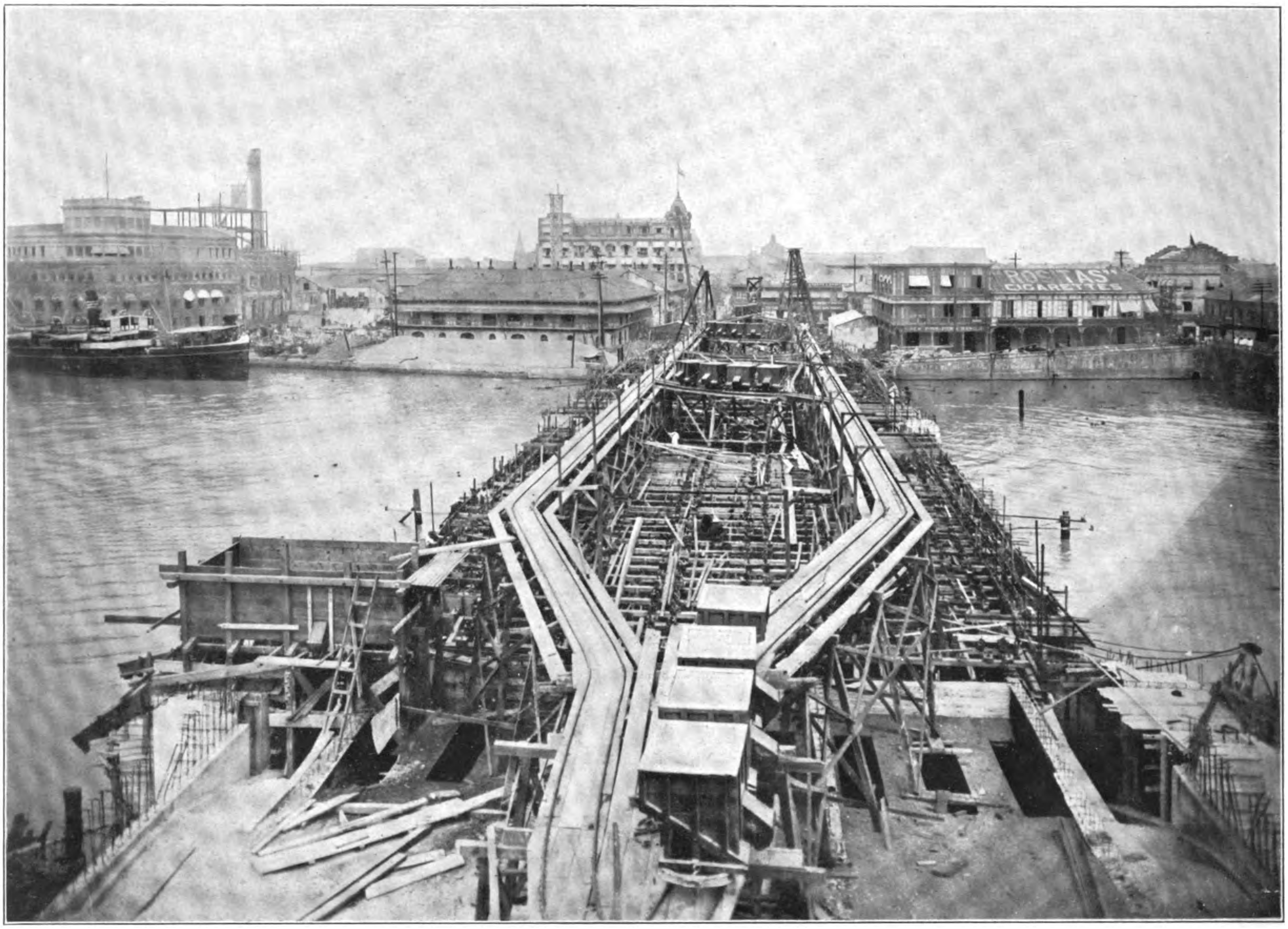


General view of the Jones Bridge under construction, Manila, P. I.

Very satisfactory progress has been made in the construction of Pier No. 7 which is being supervised by the Designing Division. This fact can be better appreciated when it is understood that this pier ranks well with the largest constructed anywhere—especially when it is considered that this structure is being constructed so remote from the United States from whence the principal materials and practically all the machinery necessary for carrying on the work must be derived. The splendid progress made has been possible only because of the untiring efforts of the entire engineering personnel connected with the project, who, as a whole, have given unstintedly of their time and strength and coöperated so closely. This close coöperation of the technical personnel connected with this project has enabled the Bureau to marshall its forces of skilled mechanics, artisans, carpenters and workers as a whole and to create a smooth working organization of more than a thousand individuals to push the project to conclusion as rapidly as possible.

The most modern engines of construction have been designed, fabricated, brought to the Philippines and commissioned on this project in an incredible short time. One of the finest and largest cranes ever brought to the Philippines was designed, fabricated and commissioned during the early part of the year at Pier No. 7. This crane will be utilized, first in handling the large piles (see photographs) and later, in handling the ships' cargo. It will be possible, upon completion of the pier, by the use of this crane, to discharge single pieces of machinery or ordnance weighing as much as 80 tons—a task which has heretofore required the erection of special equipment each time a large piece of machinery was to be removed from a vessel at this port. Approximately 70 per cent of all the necessary steel pile units have been fabricated and about 53 per cent of the necessary piles cast. All of the special low alumina cement purchased in Japan (specially ground to withstand the chemical action of the sea water), has been delivered. The difficulty experienced in the early part of the year in securing sufficient reinforcing steel for the project, considerably delayed the fabrication of the steel pile units; however, practically 90 per cent of all the necessary reinforcing steel was delivered by the close of the calendar year. The acquisition of the crushed stone and sand has progressed more or less intermittently, yet it has been possible to keep sufficient quantities on hand at all times and to meet all needs. Approximately 90 per cent of all the form lumber aggregating several million feet, has been secured and delivered to the project. Ties and steel trackage deliveries are still incomplete; however, the general construction will not be delayed on this account. Eighty per cent of the creosoted paving blocks ordered for the floor have been delivered, as have all of the mooring posts, mooring bitts, mooring cleats, etc. The steel roof trusses and steel sash as well as the steel rolling doors are expected to be received in Manila sometime in August, 1921.

The construction of the William A. Jones Memorial Bridge, at Manila, was taken over from the city of Manila by the Bureau of Public Works in the month of April, 1920, and its construction has been supervised by the Designing Division since that date. This monumental structure consisting of three large reinforced concrete arches, spans the Pasig River and connects the foot of Calle Rosario with the Magallanes Drive. Very gratifying progress has also been made during the few months that this structure has been handled



Bird's-eye view of the Jones Bridge under construction, Manila, P. I.

by this Bureau. When the project was taken over, the two central piers were in place and concreted up to approximately two feet above the water line. The subaqueous work had also been carried up above the water line on the south abutment. During the few months the Bureau of Public Works has had the project in hand, the north abutment including the subaqueous work has been completed, together with both subway arches. The steel ribs for the three main arches have all been placed and all forms suspended therefrom preparatory to concreting the arch rings. The south approach wing walls were also completed by the end of the calendar year. Present indications are that the bridge will be opened to traffic about the middle of 1921. The structure when finished, together with the adjacent walls, will cost approximately ₱3,000,000.

DIVISION OF ARCHITECTURE.

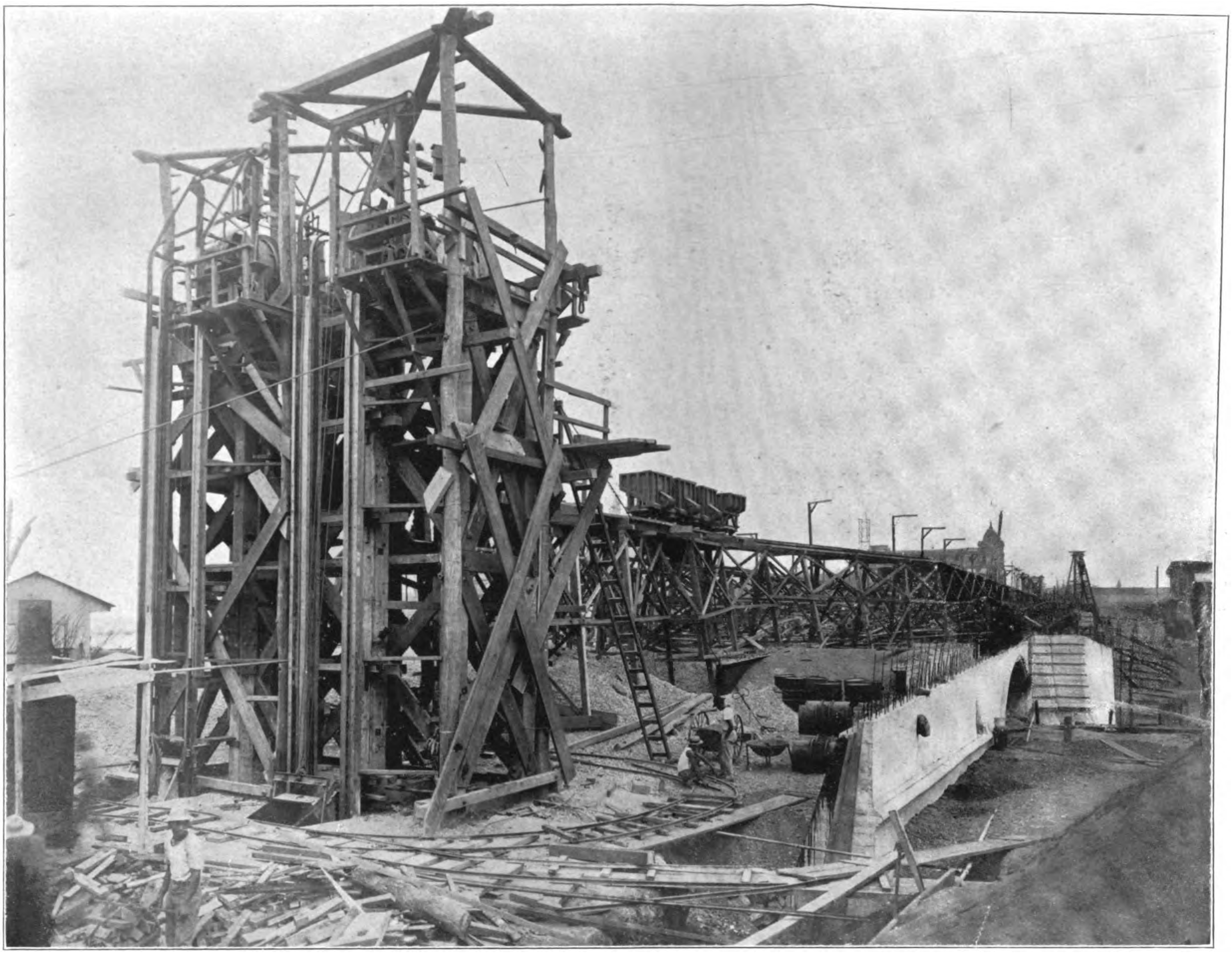
TOMAS MAPUA and JUAN ARELLANO, *Supervising Architects.*

In spite of the exensive and ever expanding building program of the Government requiring considerable studies and the preparation of numerous building plans and specifications, the technical personnel of the Division of Architecture has not been increased. This is due to the fact that competent architectural designers can not be obtained from the United States at the salaries offered, and to the shortage of such designers in these Islands; the few Filipino architects available being already in the service of the Government.

The Architectural Division has a very large volume of work covering a wide range of projects, as may be seen from the following tabulation of projects assigned to Messrs. Mapua and Arellano, respectively.

Projects assigned to Mr. Mapua showing status of each.

Manila projects.	Status.
1. Wharf Building	Under construction.
2. Malacañang Executive Building	Nearing completion.
3. Malacañang repairs	Completed.
4. Trade School	Do.
5. Nurses' Home, Philippine General Hospital	Under construction.
6. Guards' Barracks, Bilibid Prison	Nearing completion.
7. Arranque Market	Sketches completed—Pending action.
8. Manila Custom House	Plans completed.
9. Tomas Claudio Monument	Plans completed—Pending action.
10. School of Deaf and Blind	Under construction.
11. Maternity Pavilion, Philippine General Hospital	Nearing completion.
12. Dining Pavilion, Philippine General Hospital	Completed.
13. Repairs Postigo Building	Do.
14. Alteration Intendencia, (Mint.)	Do.
15. Alterations, Pier 5	Sketches completed.
16. Bureau of Forestry annex	Plans completed.
17. Supreme Court Addition	Under construction.
18. Hangars National Guard	Sketches completed.
19. Engineering Building, University of the Philippines	Under construction.
20. Chemistry Building, University of the Philippines	Do.
21. Filipino Flag	Plans completed.
22. O'Donnell School	Sketches completed—Pending action.
23. Manila High School	Do.
24. Alteration Ayuntamiento Building	Completed.
25. Annex Intendencia Building Coast and Geodetic Survey	Under construction.
26. Santa Lucia Hospital, Philippine Constabulary	Drawings in preparation.
27. Addition Normal Hall	Sketches completed—Pending action.
28. Internal Revenue Building	Pending action.

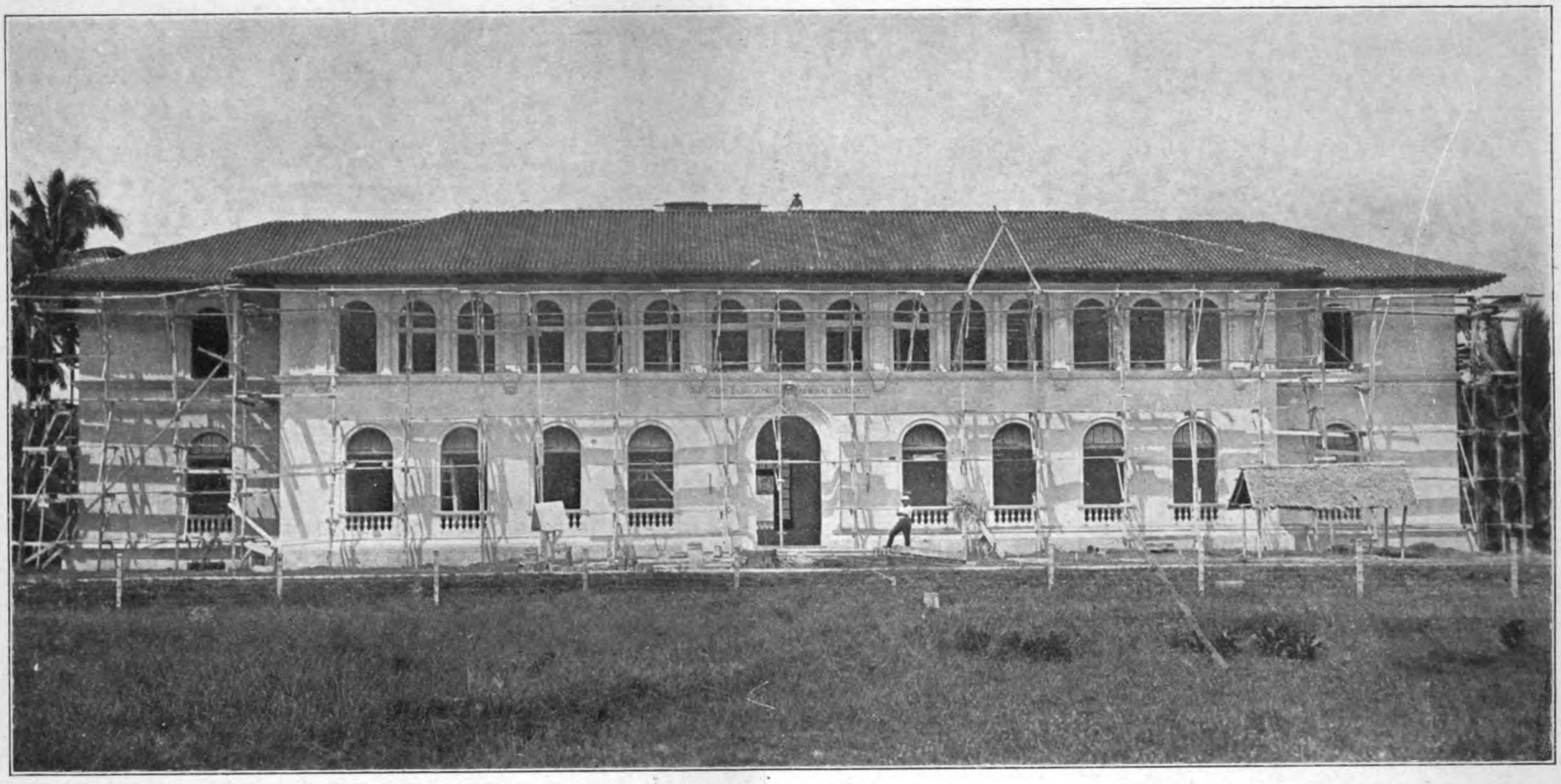


General view of the Jones Bridge, Manila, P. I.

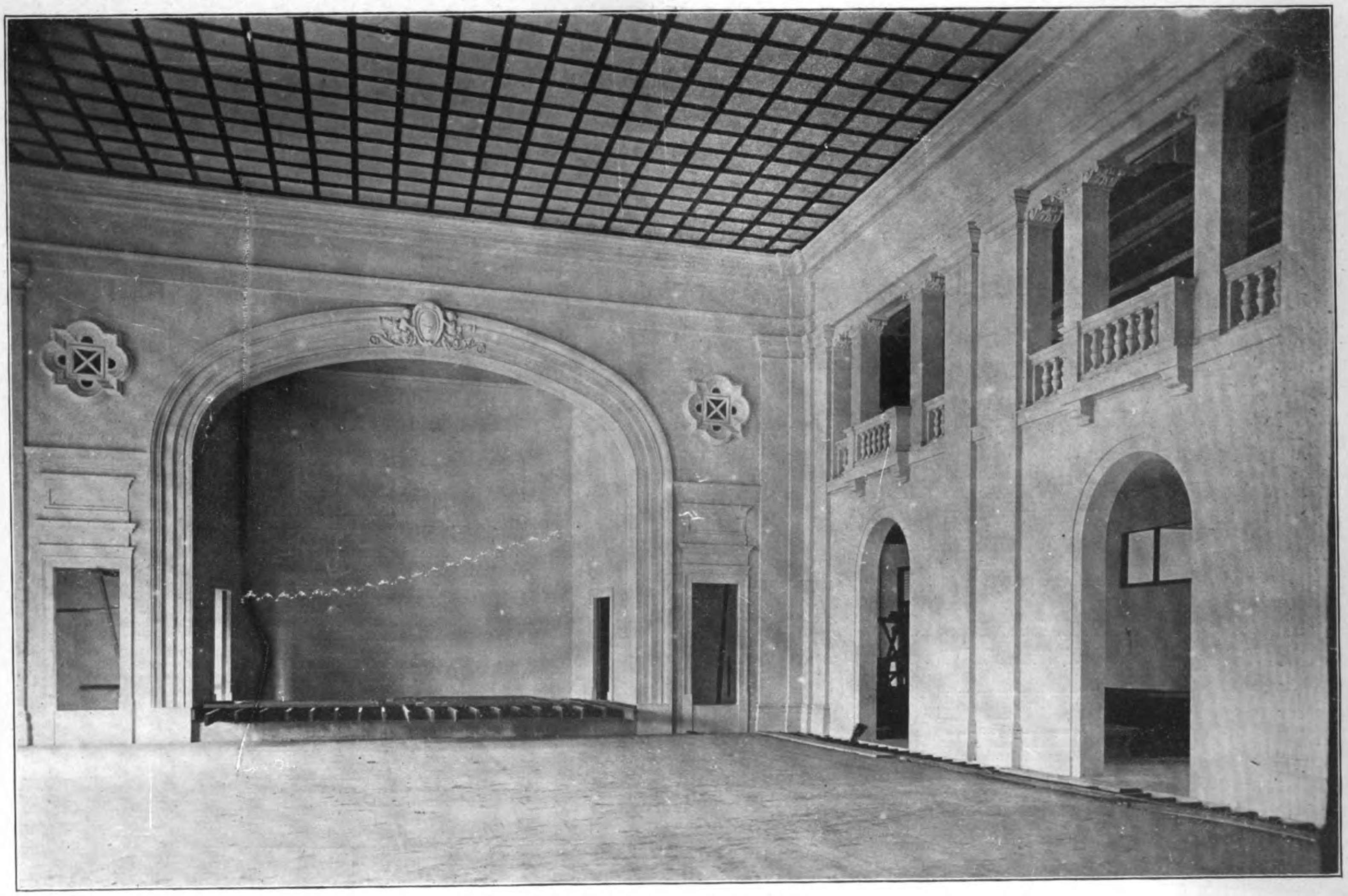
This view shows the mixing plant and trestle for handling the concrete.

Projects assigned to Mr. Mapua showing status of each—Continued.

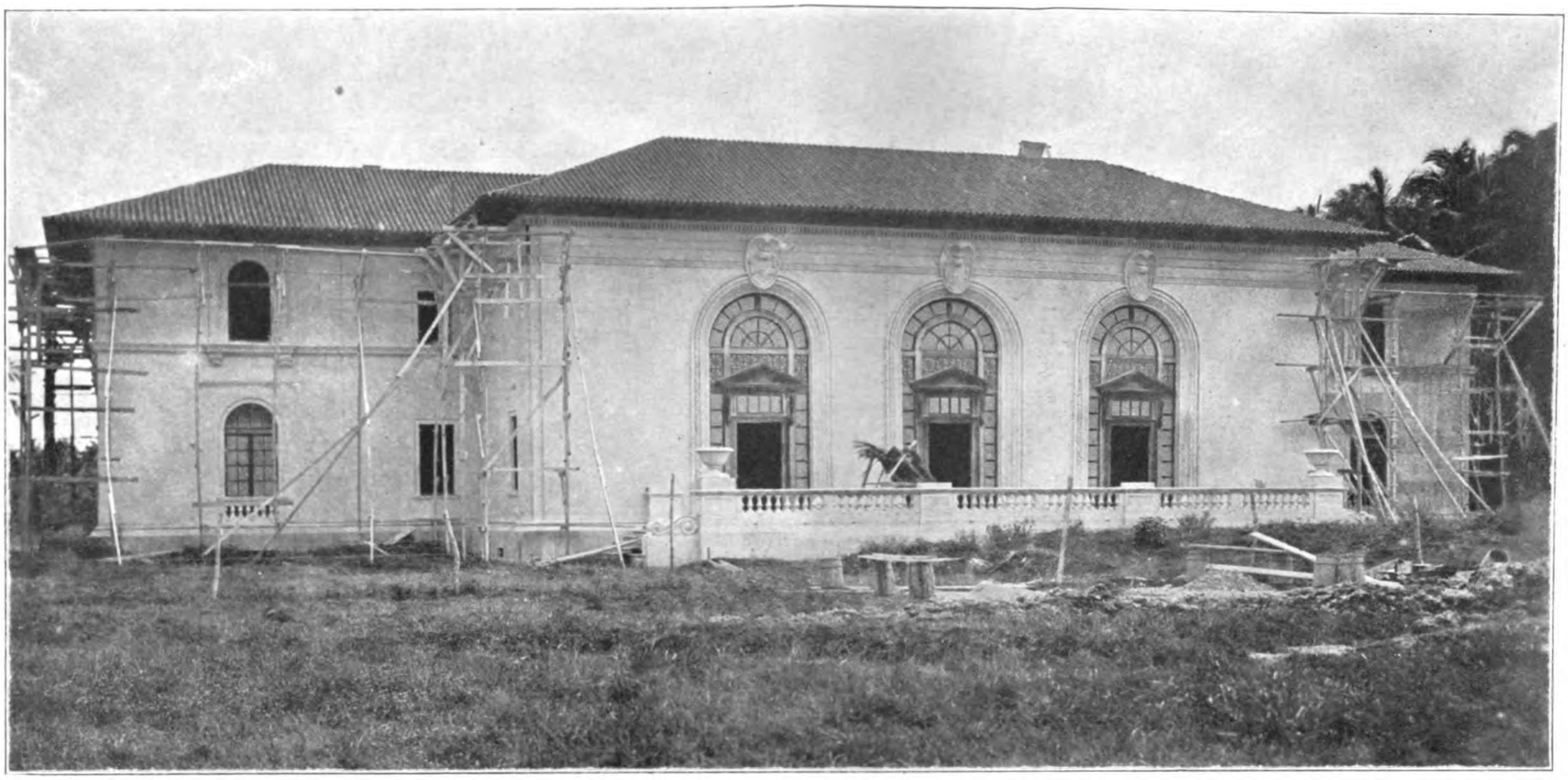
Provincial projects.	Status.
1. Laoag Provincial Building	Under construction.
2. Burawen Presidencia, Leyte	Nearing completion.
3. Alangalang Presidencia, Leyte	Do.
4. Zamboanga General Hospital	Grouping plan was prepared and plan of one pavilion was revised.
5. Laoag Normal School	Under construction.
6. Zamboanga Tiendas	Completed.
7. Constabulary Barracks and Quarters	Standard plans completed.
8. Tarlac Presidencia	Under construction.
9. Palo Presidencia, Leyte	Temporary plans approved.
10. Baybay Presidencia, Leyte	Do.
11. Iwahig Penal Colony	Standard school plan approved.
12. Bulan Presidencia, Sorsogon	Standard plan approved. Nearing completion.
13. Malasiqui Presidencia, Pangasinan	Do.
14. Alteration Iloilo Custom House	Pending action.
15. Tiwi School, Albay	Do.
16. Aparri, Philippine National Bank and warehouse	Complete plans were prepared—Pending action.
17. Bodegas, Philippine National Bank	Sketch plans were prepared.
18. Tarlac High School	Under construction.
19. Cebu Normal School	Plans in preparation.
20. Bohol Provincial Building and Jail	Plans completed.
21. Wireless Stations	Standard plans completed—Several stations are completed and others are under construction.
22. University of the Philippines Agricultural School, Los Baños, Laguna	Plans approved.
23. Peñablanca Presidencia, Cagayan	Plans are completed.
24. Cabanatuan High School	Under construction.
25. Layout Municipality of Angeles, Pampanga	Sketches completed.
26. Nueva Ecija School	Under construction.
27. Bontoc Hospital, Mountain Province	Plans approved.
28. Laoag Dormitory	Plans in preparation.
29. Bayombong Hospital, Nueva Ecija	Plans approved.
30. Bontoc Presidencia	Plans completed.
31. Cabatuan School, Iloilo	Pending action.
32. Alabang power house	Plans in preparation.
33. Nueva Ecija court room	Sketches completed.
34. Dingle Presidencia, Iloilo	Plans in preparation.
35. Marilao Baths, Bulacan	Plans completed.
36. Gumaca Presidencia	Plans approved.
37. Candelaria Presidencia	Do.
38. Capiz Jail	Pending action.
39. Cebu Market	Do.
40. Cebu Hospital	Do.
41. Pangasinan Hospital	Do.
42. San Miguel School, Bulacan	Do.
43. Cebu Warehouse	Do.
44. Iloilo Hospital	Do.
45. Samar Capitol Building	Do.
46. Palawan Provincial Building	Do.
47. Lubuagan Presidencia	Plans completed.



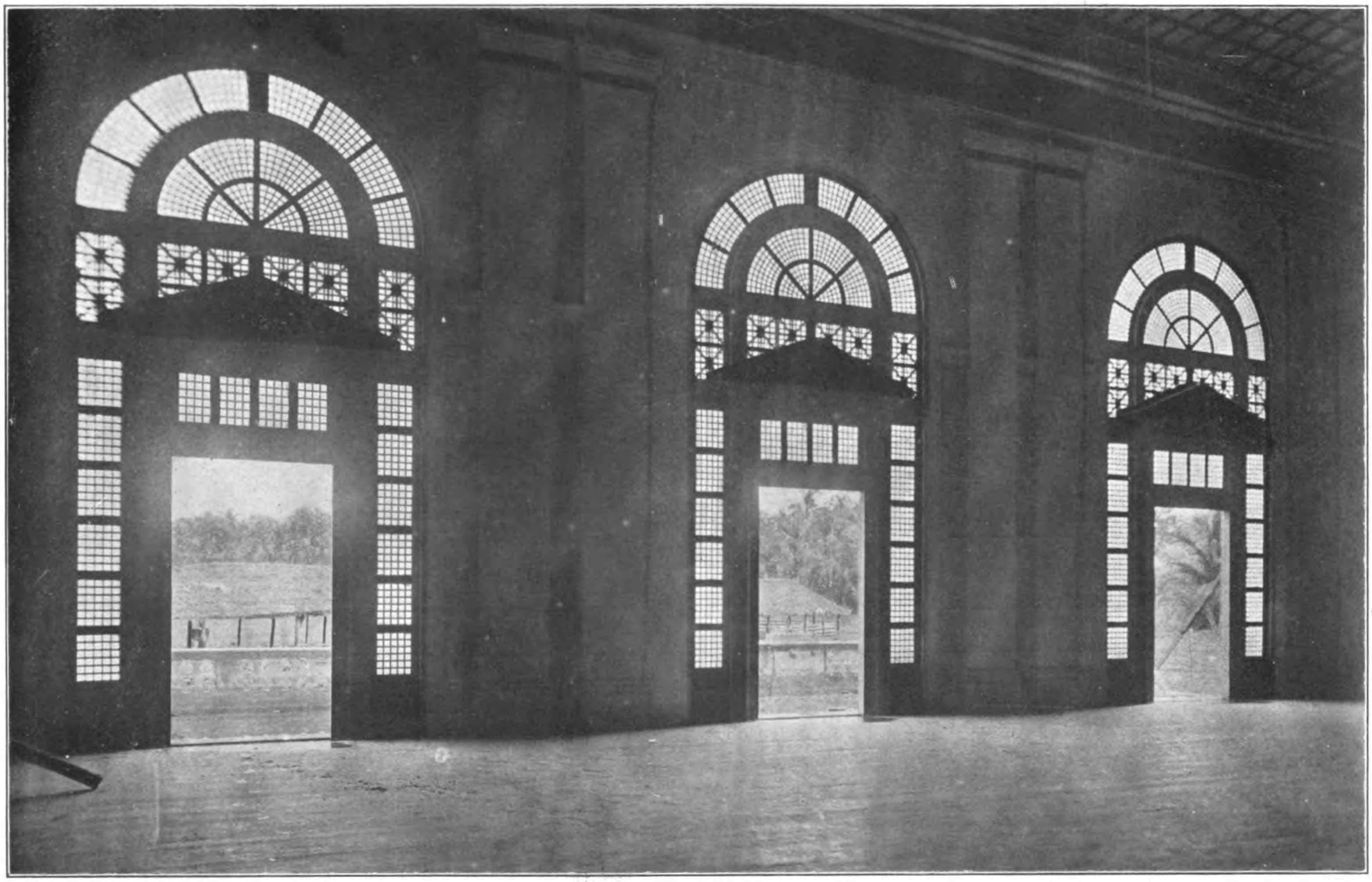
Front view, Zamboanga Normal School.



Auditorium, Zamboanga Normal School.



Rear view, Zamboanga Normal School.



Entrance to Auditorium, Zamboanga Normal School, showing shell doors at rear.

The pool whence the Burgos Irrigation System will get its water, Ilocos Norte.

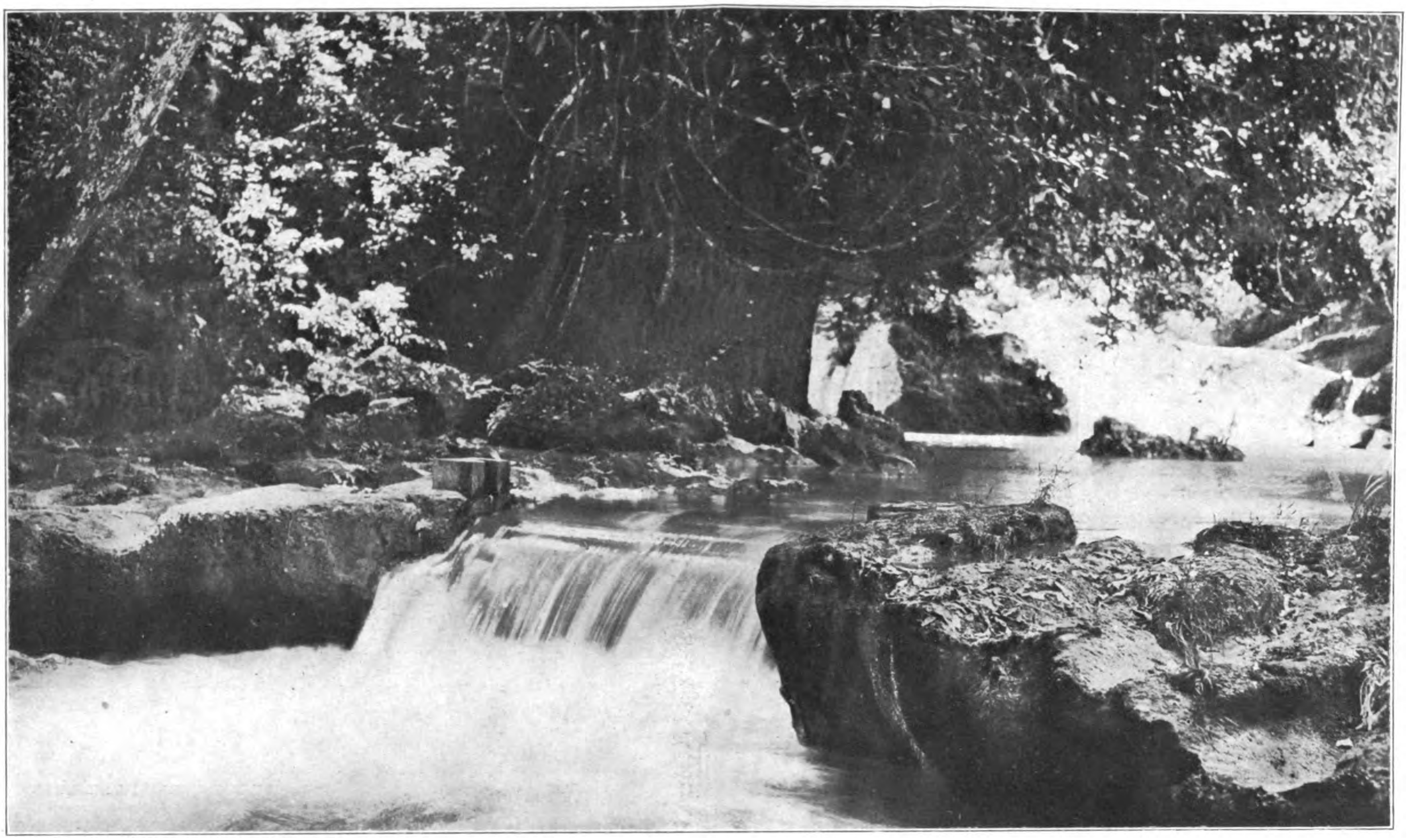
Projects assigned to Mr. Arellano showing status of each.

Manila projects.	Status.
1. Insular Government Building	Piling and foundation work completed. Construction work on the ground floor is now in progress.
2. Insane Ward, San Lazaro Hospital	Project completed, except cornice. The building is now occupied.
3. Contagious Disease Ward, San Lazaro	Completed.
4. Bureau of Printing machine shop	Nearing completion.
5. Rizal Hall, University of the Philippines	Do.
6. Post Office	Piling work was started October 5, 1920.
7. Damp Proof Vaults, Bureau of Forestry	Completed.
8. Veterinary Research Laboratory, Pandacan	Do.
9. Teachers' Monument	Do.
10. Burnham Memorial	All plans and specifications completed. Work will start as soon as all ornamental works are delivered for erection.
11. Entrance Gate, San Lazaro Hospital	Completed.
12. Jones Bridge	Nearing completion. Architectural design revised to give the structure a more imposing and attractive appearance.
13. Luneta Band Stand	Preliminary sketches prepared. Pending decision of the city of Manila.

Provincial projects.	Status.
1. Manito Presidencia, Albay	Completed.
2. Mabini School, Batangas	Do.
3. Goa Presidencia, Camarines Sur	Do.
4. Osmeña Mausoleum, Cebu, Cebu	Nearing completion.
5. Rizal Monument, Davao, Davao	Completed.
6. Iloilo Normal School, Iloilo	Under construction.
7. Veterinary School, Los Baños, Laguna	Nearing completion.
8. Leyte Capitol Building, Tacloban, Leyte	Do.
9. Lucena Girls' Dormitory, Lucena, Tayabas	Under construction.
10. Zamboanga Normal School, Zamboanga, Zamboanga	Nearing completion.
11. Majayjay Market, Laguna	Under construction.
12. Zamboanga Trade School, Zamboanga, Zamboanga	Do.
13. Sariaya Rizal Park, Tayabas	Do.
14. Sibul Springs Midden Shed, Bulacan	Completed.
15. Ilocos Sur Provincial Building, Vigan, Ilocos Sur	Plans completed.
16. San Pedro Presidencia, Laguna	Do.
17. Zambales Provincial Building, Iba, Zambales	Plans completed.
18. Philippine National Bank Branch, Iloilo	Do.
19. Tayabas Court Room, Lucena, Tayabas	Under construction.
20. Layout of municipal squares, Province of Camarines Sur	Plans completed.
21. Cebu Post Office, Cebu, Cebu	Preliminary sketches completed.
22. Batangas Capitol Building, Batangas, Batangas	Do.
23. Binmaley Municipal School, Pangasinan	Plans completed.
24. Pasonanka Museum, Zamboanga	Preliminary plans completed.
25. A. W. Austin Monument, Nueva Fcija	Completed.

General Layout of the Post Office Building and Jones Bridge.—Many small details and modifications have been made to the present layout of the parks and streets in the vicinity of the Jones Bridge and Post Office Building in order to conform with and carry out the Burnham scheme in the most practical and efficient manner and to dispose of the heavy traffic which will make use of the thoroughfares leading to these structures. These changes will cover an extensive area and will involve the construction of new parks and the formation of isolated areas to serve as points of interest. The Magallanes Drive will be beautified by the construction of a park near the quay which will be adorned by fountains and monuments. Tamarind trees will border both sides. The tramway tracks in the center of this drive as well as those on Padre Burgos Avenue will be located adjacent to the old Spanish fortification walls along these avenues. The Magallanes Drive is to be 20 meters in width and will run almost parallel to the Pasig River.

Padre Burgos Avenue will have for its terminal a circle with a radius of 36.50 meters and at its center it is proposed to erect a decorative fountain surrounded by small parks. The areas included between the streets radiating from this circular terminal will be in the form of triangular lawns bordered with shrubberies and other ornamental plants. Decorative fountains are also proposed for their



The same pool that appears on opposite page showing the weir on the other side of which will be the headworks for the main canal. Burgos Irrigation System, Ilocos Norte.

centers. Tamarind trees will also border each side of Padre Burgos Avenue and other hardy trees will be planted to serve as background in order that they may form a contrasting and pleasing foliage.

The planting of the tamarind and other hardy trees along all the highways and avenues of the Philippines as practiced in Java would avoid a recurrence of the disastrous effects resultant from the use of the acacia trees as was witnessed during the last typhoon of August, 1920 in Manila. Hardy wood trees are slow of growth but the final result will prove more beneficial and lasting, and their adoption is recommended. When all parking and streets shall have been laid out as at present planned, Padre Burgos Avenue will be one of the most beautiful and attractive streets in the city. A street system of liberal widths has been planned in the vicinity of the Post Office in order to facilitate the ingress and egress of traffic about this public building. An appropriate landing for river launches has been provided at the rear of the Post Office Building to facilitate the handling of mails by water. It is proposed to establish a public comfort station surrounded by tall shrubberies on the area between the Post Office Building and the Jones Bridge.

Jones Bridge.—The original architectural designs called for plain surfaces; however, these were changed to provide a more elaborate design and a fitting memorial in honor of the late United States Congressman, the Honorable William Atkinson Jones, the author of the Jones Law. The Jones Bridge will be decorated by pylons and statuary and will be interposed and embellished by graceful bronze candelabra. The buttresses will be adorned by ornamental figures. Both approaches to the bridge will be decorated by pylons serving as the basis for the entire group of allegorical statuary representing DEMOCRACY, JUSTICE, GRATITUDE, and PROGRESS.

IRRIGATION DIVISION.

A. D. WILLIAMS, *Chief Irrigation Engineer.*

The personnel of the Irrigation Division was substantially increased during the year which enabled the Division to further extend its activities.

IRRIGATION PROJECTS APPROVED FOR CONSTRUCTION.

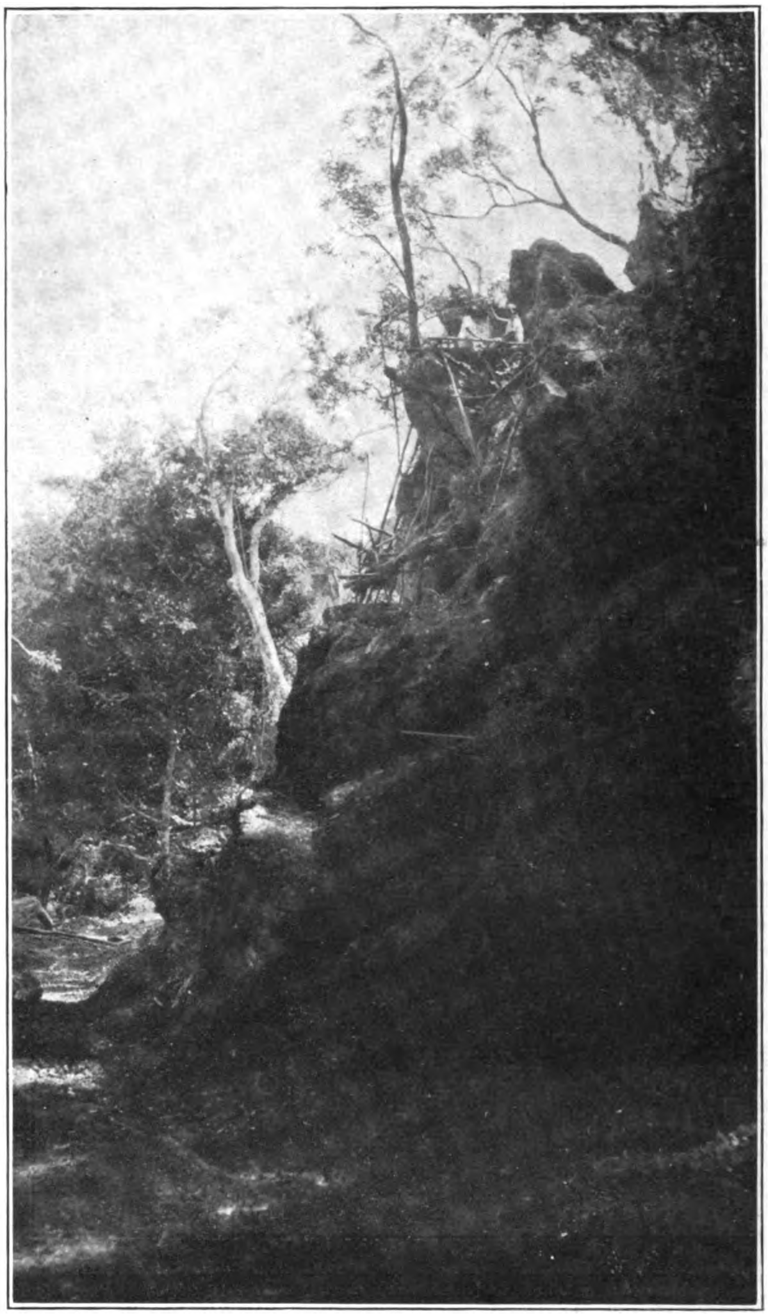
Construction work was performed on the ten irrigation projects approved for construction during 1919, and preliminary plans and estimates prepared for six additional projects which were approved during 1920 for construction under the provisions of Acts Nos. 2152 and 2755. A complete list of these projects is given in the following tables showing the area to be irrigated, estimated cost, and allotments authorized to date.

Irrigation projects approved for construction in 1919.

Project.	Province.	Irrigable area.	Estimated cost.	Allotments authorized.		Remarks.
				Amounts.	From Act No.	
		Hectares.				
Ayala	Zamboanga	133	₱7,500	₱500	2786 (*f*)	Municipal project.
				5,000	2786(*nn*)	
Santa Maria	Zamboanga	431	21,000	2,000	2786 (*f*)	Municipal project.
				14,000	2786(*nn*)	
Trinidad	Mountain Province.	200	40,000	40,000	2786(*nn*)	Insular project.
Santa Barbara	Iloilo	4,500	500,000	250,000	2736	Do.
				186,000	2786	
Baruyen River	Ilocos Norte	1,000	56,000	56,000	2736	Do.
Tagudin	Ilocos Sur	1,300	100,000	100,000	2736	Do.
Dingras	Ilocos Norte	1,200	106,000	106,000	2736	Do.
Amburayan River	La Union	4,500	642,000	249,000	2786	Do.
Talavera River	Nueva Ecija	8,000	928,000	310,000	2736	Do.
Dipolog	Zamboanga	1,000	60,000	28,000	2736 (*ee*)	Municipal project.
				9,500	2736 (*f*)	
Total		22,314	2,460,500	1,356,000		

The construction of the three smaller projects, the Trinidad drainage and irrigation system in the subprovince of Benguet and the Ayala and Santa Maria systems in Zamboanga Province, was practically completed at the end of the year. Construction work is well under way on the other projects, and, on the Santa Barbara, Baruyon, Dingras and Dipolog projects, should be completed during the year 1921. The Tagudin, Amburayan River and Talavera River

Looking up the main canal. Observe the big boulders and loose rocks. These are all lime rocks of a very porous nature. Mr. A. D. Williams is seen among the laborers. Burgos Irrigation System, Ilocos Norte.

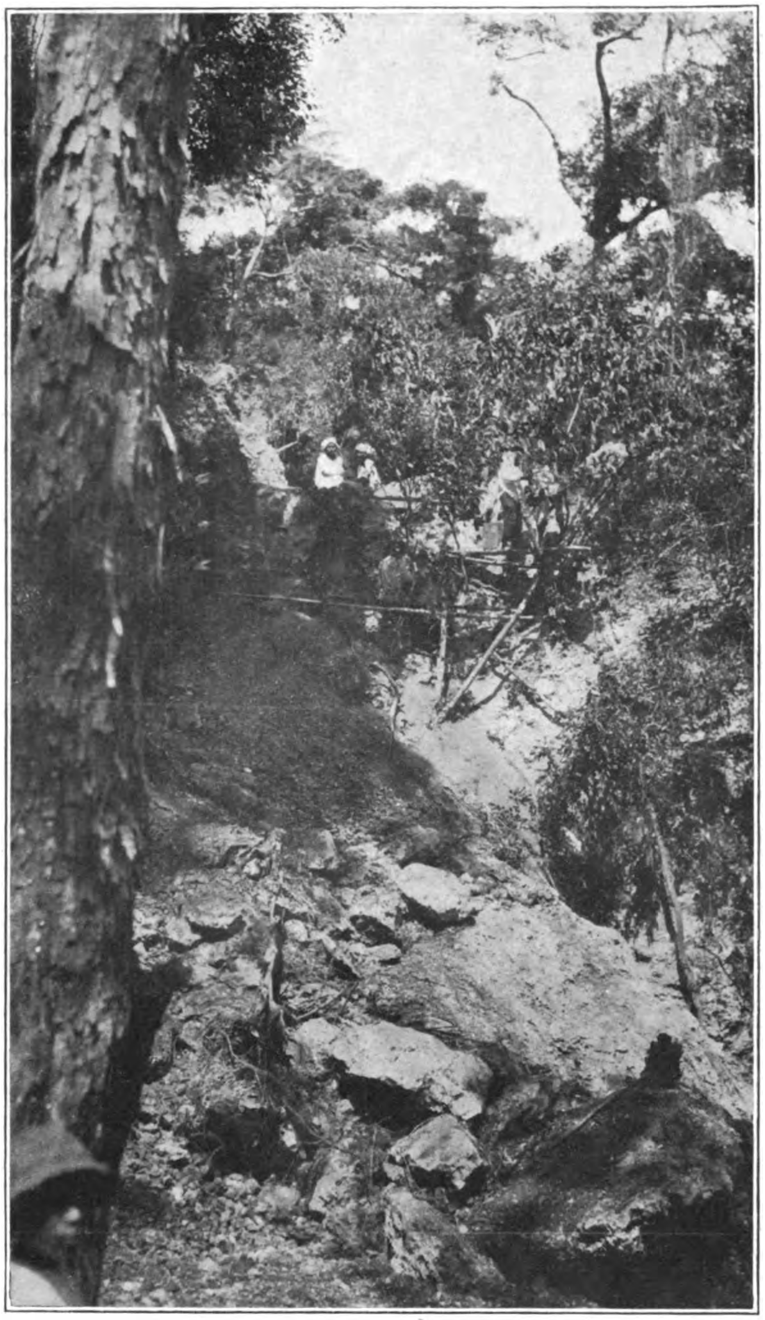


Looking up the main canal. Observe the laborers on the rocks; they are women drilling dynamite holes. This simply shows the difficulty of obtaining laborers for this project, where in the absence of men, women are employed. Burgos Irrigation System, Ilocos Norte.

projects should be finished and placed in operation for the 1922 rice crop. With the exception of the Santa Barbara and Talavera River projects, all the above-named projects are being constructed by administration using the "paquiao" system for employing labor for excavation work whenever advantageous to the Government. The contract for the excavation of the canal system for the Santa Barbara project was awarded to Mr. Edmund A. Vail of Iloilo in January, 1920, and under the terms of the contract work on this project should have been completed in January, 1921, but due to delays in the work, for which the Government and labor conditions in the southern sugar districts are responsible, Mr. Vail has been granted an extension of time to June 1, 1921. The structures for the Santa Barbara project are being constructed under contract with the Atlantic Gulf and Pacific Co. of Manila, which is required under the terms of the contract to complete this work before July 1, 1921. This should allow the system to be placed in operation for the next rice growing season. The excavation of the main canal for the Talavera River irrigation project, which is approximately 12 kilometers long, is being accomplished under contract with Mr. Sotero Baluyot of Pampanga Province. Plans and specifications have been prepared for the diversion weir and main canal structures which will be advertised for bids at an early date. Plans for the Amburayan River project are in preparation while complete plans have been prepared for all of the remaining projects approved for construction during 1919.

Irrigation projects approved for construction in 1920.

Project.	Province.	Irrigable area.	Estimated cost.	Allotment authorized.		Remarks.
				Amounts.	From Act No.	
		Hectares.				
Laoag-Vintar	Ilocos Norte	6,000	₱1,100,000	₱270,000	2898	Insular project.
Aganao River	Iloilo	5,500	916,000	300,000	2898	Do.
Lamao	Bataan	160	30,000	30,000	2898	Do.
Angat River	Bulacan	25,000	4,500,000	450,000	2898	Do
Naic	Cavite	800	275,000	150,000	2898	Do.
Balaoan	La Union	1,400	80,000	30,000	2898	Municipal project.
Total		38,860	6,401,000	1,230,000	--------	



Looking down the main canal. Observe the women drilling the holes for dynamite work. The point is to be brought down to the grade of the canal. Male laborers are difficult to obtain for this project. Burgos Irrigation System, Ilocos Norte.

Looking down the main canal. Observe the high point where the laborers are working. This is one of the many points to be brought down to the grade of the canal. Burgos Irrigation System, Ilocos Norte.

A contract for the construction of the diversion weir and headworks and the excavation of the canal system for the Naic project was awarded to the Manila Engineering Co. in December, 1920, and this project should also be completed during 1921. Plans and specifications were prepared for the canal system for the Aganao River project and for the south side of the Angat River project embracing 15,000 hectares of land, and advertised in December. Bids for this work are to be opened in January; this will permit construction work to be started at an early date. The Aganao River project should be completed in 1922. The present program contemplates constructing the Angat River project, embracing a total area of 25,000 hectares, during the next four years, opening the south side of the project for the 1923 rice planting season and the north side in 1924. Plans and specifications are in preparation for the Lamao project which will benefit 160 hectares of land in the Bureau of Agriculture's Experiment Station reservation in Bataan Province. The construction of the Laoag–Vintar project has been delayed by protest against estimated charge for water to be supplied through the proposed system to land owners who have prescriptive rights to water from the Vintar River, the proposed source of the new system. There are fourteen old ditches diverting water below the proposed Government dam site. To insure a better distribution of water to the lands supplied by these existing ditches, and, at the same time, to furnish water to 3,000 additional hectares of land greatly in need of irrigation, it was necessary to include the entire area of irrigable and irrigated lands in one comprehensive irrigation system under Government management. The estimated charges for water to be delivered to the old ditches and for the land which is not under irrigation were computed, so far as possible, on the basis of the benefits to be derived. These charges were protested by most of the land owners under the old ditches, who indicated, however, their desire to have the project constructed as planned and their willingness to pay not to exceed ₱2 per hectare per annum. Since their payments would be practically sufficient to reimburse the Government for the additional cost of the project to supply water to the old ditches, and since the owners of land at present not irrigated are willing to pay higher charges for water to reimburse the Government for the cost of construction, under the provision of the Irrigation Act, construction can be recommended at an early date under these conditions.

Preliminary plans have been prepared for the Balaoan project and construction work can be undertaken as soon as the municipality of Balaoan appropriates one-third of the estimated cost as required by Act No. 2755.

PROJECTS RECOMMENDED FOR CONSTRUCTION.

The following municipal irrigation projects recommended for construction in 1919 are still pending approval due to the inability of the municipalities concerned to finance one-third of the estimated cost in accordance with the provisions of Act No. 2755.

Pililla Irrigation Project, Province of Rizal.
Morong Irrigation Project, Province of Rizal.
San Fabian Irrigation Project, Province of Pangasinan.
Mangatarem Irrigation Project, Province of Pangasinan.

IRRIGATION PROJECTS UNDER CONSIDERATION.

The more important irrigation projects under consideration with the estimated irrigable area and status of each are given in the following table:

Irrigation projects under consideration.

Province.	Project.	Estimated area.	Status.
		Hectares.	
Albay	Viga irrigation project	500	Awaiting investigation.
Do	Quinale Lake Bato project	6,000	Do.
Do	Malinao project	600	Do.
Ambos Camarines	Naga irrigation project	10,000	Do.
Do	Daet irrigation project	2,000	Investigation in progress.
Do	Talisay-Indan project	3,000	Do.
Do	Culasi irrigation project	2,000	Awaiting investigation.
Do	Pauili Valley irrigation project	10,000	Investigation in progress.
Do	Barit River irrigation project	2,000	Awaiting investigation.
Do	Uarus River irrigation project	2,000	Do.
Do	Libmanan irrigation project	5,000	Do.
Antique	Sibalom irrigation project	3,000	Preliminary survey completed.
Bataan	Dinalupihan irrigation project	2,500	Awating investigation.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon irrigation project	2,000	Awaiting investigation.
Do	Mambusao irrigation project	1,000	Preliminary investigation, 1911.
Do	Macato-Malinao irrigation project.	1,200	Do.
Do	Ibahay irrigation project	550	Do.
Cavite	Maragondon irrigation project	400	Topographic survey completed.
Do	Carmona irrigation project	400	Do.
Ilocos Norte	San Nicolas irrigation project	4,000	Preliminary investigation, 1910.
Ilocos Sur	Abra River irrigation system	10,000	Preliminary survey completed 1910.
Do	Candon irrigation project	3,000	Investigation in progress.
Batangas	Batangas irrigation project	1,000	Awaiting investigation.
Do	Balayan irrigation project	300	Do.
Do	San Juan de Bocboc project	1,000	Do.
Iloilo	Jalaur River irrigation project	18,500	Topographic survey completed.
Do	Pototan irrigation project	2,300	Survey and preliminary design made.
Do	Cordova irrigation project	1,000	Topographic survey completed.
Isabela	Magat River project	40,000	Awaiting investigation.
Laguna	Santa Cruz River irrigation project.	5,000	Investigation in progress.
La Union	Bacnotan irrigation project	2,000	Preliminary investigation, 1901
Do	Agoo-Tubao project	2,000	Awaiting investigation.
Do	Naguilian irrigation project	1,000	Do.
Do	Rosario irrigation project	1,000	Investigatio n in progress.
Leyte	Barugo irrigation system	1,000	Preliminary survey made.
Do	Dagami-Tanawan irrigation system.	14,000	Preliminary investigation, 1910.
Do	Bato-Hilongos irrigation project.	3,500	Do.
Nueva Ecija	Pampanga River irrigation project.	20,000	Investigation in progress.
Do	Peñaranda irrigation system	10,000	Do.
Nueva Vizcaya	Murong irrigation project	800	Do.
Occidental Negros	Binalbagan-Himamaylan	3,000	Topographic survey completed.
Do	Bago irrigation project	20,000	Awaiting investigation.
Do	Silay irrigation project	5,000	Do.
Do	Hinigaran irrigation project	3,000	Topographic survey in progress.
Do	La Granja express station project.	200	Investigation in progress.
Oriental Negros	Tanjay irrigation project	800	Awaiting investigation.
Do	Tolong irrigation project	3,000	Do.
Pampanga	Porac River project	1,000	Do.
Do	Bamban River irrigation project	3,000	Do.
Do	Curain irrigation project	5,000	Do.
Pangasinan	Agno River irrigation project	30,000	Topographic survey made 1910.
Rizal	Mariquina Valley irrigation project.	5,000	Topographic survey completed.
Tarlac	Capas irrigation project	5,000	Awaiting investigation.
Do	Tarlac irrigation project	5,000	Do.
Zambales	San Marcelino irrigation project	5,000	Topographic survey completed.
Total estimated area		316,470	

It will be noted from the above that the Division has, in addition to the projects approved and recommended for construction, 57 important projects under consideration that would benefit an estimated area of over 300,000 hectares. Topographic surveys have been completed for 13 of these projects which cover a total area of over 70,000 hectares and investigations and surveys are now in progress on 10 additional projects that would benefit 55,000 hectares of land. Attention is again invited to the advisability of financing the construction of irrigation projects from funds derived from bond issues rather than depending upon annual appropriations from current revenues of the Government in order that a more systematic policy may be pursued in developing projects to meet rice shortages. The demand for the construction of irrigation systems to insure the rice harvest and to increase the yield of rice has been emphasized in numerous resolutions received from Municipal Councils and Provincial Boards during the year and in a recent resolution of the Agricultural Congress of the Philippines.

MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS.

The San Miguel irrigation system in Tarlac Province was maintained and operated at a cost of ₱42,756.50, including the cost of making temporary repairs on the river dyke above the headworks and the main canal which were damaged by the flood of August 1919. The "Compañía General de Tabacos de Filipinas," which own the land under the system was furnished a continuous supply of water for an area considerably in excess of that cultivated in 1919, surveys being under way to determine same. Attention in this connection is invited to recommendations submitted under date of September 3, 1920, for the disposition of the system in view of the financial obligations involved in continuing the maintenance and operation of the system under the terms of the contract now in force.

The Pilar irrigation system in Bataan Province was maintained and operated by the district engineer under the supervision of this Division at a cost of ₱1,767.29.

HYDROGRAPHIC INVESTIGATIONS.

There were a total of 160 permanent gaging stations maintained on streams in 32 provinces at the end of the year for which daily gage height records are kept and frequent gagings made by hydrographers of the Division. In addition to those stations, miscellaneous measurements were made at 40 temporary stations in connection with water right applications and the determination of existing rights. The table shown on page 41 is a complete list of permanent stations grouped by provinces.

In pursuance of the recommendations made in the report of the Division for last year, all the hydrographic data available in the Division including old records from 1908 to 1913 and new records from 1918 to 1920 have been compiled and will be ready for publication in bulletin form at an early date. These data will be of greater value in this form not only to Government engineers but to private parties in connection with the development of irrigation, water supply systems and hydro-electric projects.

Permanent stations.

Province.	Stream.	Municipality.	Type of station.
Abra	Abra	San Quintin	Raft.
Albay	Paulog	Ligao	Wading.
Do	Quinali	Guinobatan	Do.
Do	do	Malinao	Do.
Do	do	Polangui	Bridge.
Do	San Francisco	Malinao	Wading.
Antique	Sibalom	Sibalom	Raft.
Do	Tipuluan	do	Wading.
Bataan	Lamao	Limay	Do.
Do	Orani	Orani	Do.
Bulacan	Angat	Norzagaray	Cable.
Do	Bulo	San Miguel	Boat.
Do	Maasim	San Rafael	Bridge.
Do	Santa Maria	Santa Maria	Do.
Cagayan	Bañgul	Solano	Bridge.
Camarines Sur	Anayan	Pili	Wading.
Do	Barit	Iriga	Do.
Do	Colasi	Goa	Do.
Do	Inarihan	Calabañga	Do.
Do	Lagonoy	Lagonoy	Do.
Do	Pawili	Pili	Do.
Do	Paras	Baso	Bridge.
Capiz	Aclan	Malinao	Boat.
Do	Mambusao	Mambusao	Wading.
Cavite	Biñang	Carmona	Do.
Do	Cay Alemang	Naic	Weir.
Do	Maragondon	Maragondon	Wading.
Do	do	do	Do.
Do	Tatlong Balon	Naic	Weir.
Cotabato	Auang	Auang	Wading.
Do	Cabacan	Cabacan	Do.
Do	Catiagauan	Bual	Do.
Do	Libuñgan	Libuñgan	Do.
Do	Maganoy	Maganoy	Boat.
Do	Malitibug	Bao	Wading.
Do	Mitoan	Parang	Bridge.
Do	Pulangui	Sabacan	Boat.
Do	Salimbao	Salimbao	Wading.
Davao	Talomo	Davao	Do.
Ilocos Norte	Abis	Burgos	Weir.
Do	Alabaan	Dingras	Wading.
Do	Bolo	Bangui	Do.
Do	Paoay Canal	Paoay	Do.
Do	Paoay Lake	do	None.
Do	Salsalumague ditch	Vintar	Wading.
Do	Vintar	Bacarra	Do.
Do	do	Vintar (Salsalumague)	Do.
Do	do	Vintar (Visaya)	Do.
Do	Visaya Canal	Vintar	Do.
Ilocos Sur	Casupitan	Bauguen	Do
Do	Chico	Tagudin	Cable.
Do	Langlanca	Galimuyod	Float.
Do	Narvacan	Nagbukel	Wading.
Iloilo	Aganao	San Miguel	Do.
Do	Jalaur	Dingle	Cable.
Do	Sibalom	Leon	Wading.
Do	Suague	Pototan	Do.
Do	Tigom	Santa Barbara	Bridge.
Do	Ulian	Dueñas	Do.
Isabela	Cagayan	Echague	Do.
Do	Canano	Angadanan	Wading.
Laguna	Botocan	Majayjay	Bridge.
Do	Laguna Lake	Los Baños	None.
Do	Santa Cruz	Nagcarlang	Cable.
Do	Santa Cruz Canal	do	Wading.
Lanao	Agus	Momungan	Raft.
Do	Gata	Tamparan	Boat.
Do	Iligan	Iligan	Wading.
Do	Kapay	Kapay District	Float.
Do	Malaig	Tamparan	Wading.
Do	Matling	Malabang	Do.
Do	Ramain	Ramain	Do.
Do	Rumayas	Tamparan	Do.
Do	Taraca	do	Do.
La Union	Amburayan	Subipon	Cable.
Do	Aringay	Tubao	Wading.
Do	Maluyo	Balaoan	Do.
Do	Muragayap	Bacnotan	Do.
Do	Naguilian	Naguilian	Do.
Do	San Gabriel	San Gabriel	Do.
La Union	Sapang Grande	Bauang	Weir.
Leyte	Binahaan	Dagami	Wading.
Do	Daguitan	Burawen	Do.
Do	Guinarona	Dagami	Bridge.
Do	Minunang	Barugo (Calineaguing)	Wading.
Do	do	Barugo (Tuñga)	Do.
Do	Quilot	Dagami	Bridge.
Mindoro	Pulang Tubig	Calapan	Float.
Mountain Province	Agno	Itogon	Cable.
Do	Bued	Camp One	Wading.
Do	Trinidad	Trinidad	Weir No. 1.
Do	Canal No. 1	do	Weir No. 2.
Do	Canal No. 2	do	Weir No. 3.
Negros Occidental	Bago	Bago	Boat.
Do	Bogahin	La Castellana	Wading.
Do	Camansi	Hinigaran	Do.
Do	Guintubhan	Isabela	Do.
Do	Imbang	Talisay	Do.
Do	Maao	Bago	Do.
Do	Malugo	Saravia	Do.
Do	Maragandang	Bago	Do.
Do	Pag-iplan	Himamaylan	Do.
Do	Sicaba	Manapla	Raft.
Negros Oriental	Mangoto	Tanjay	Wading.
Nueva Ecija	Baliuag	Santo Domingo	Do.
Do	Dibabayan	do	Bridge.
Do	Minalungao	Peñaranda	Wading.
Do	Pampanga	Cabanatuan	Raft.
Do	do	Rizal	Cable.
Do	Peñaranda	Peñaranda	Wading.
Do	Rio Chico	do	Do.
Do	Rizal Canal	Rizal	Do.
Do	Talavera	San Jose	Do.
Do	do	Talavera	Do.
Nueva Vizcaya	Lamut	Bagabag	Do.
Do	Lanog	do	Do.
Do	Magat	Bayombong	Do.
Do	Morong Canal	Bagabag	Do.
Pampanga	Balsic	Floridablanca	Do.
Do	Gumais	do	Do.
Do	Porac	do	Do.
Pangasinan	Agno	Bayombong	Bridge.
Do	do	San Manuel	Cable.
Do	Agno Chico	Asingan	Bridge.
Do	Manila	Umingan	Do.
Do	Bued	San Jacinto	Wading.
Do	Caruyungan	Umingan	Do.
Do	Pao	Manaoag	Bridge.
Do	Pila	Mangatarem	Wading.
Do	Tagomising	Binalonan	Do.
Do	Toboy	Asingan	Do.
Rizal	Ampid	San Mateo	Bridge.
Do	Banaba	do	Do.
Do	Baras	Tanay	Weir.
Do	Bulac	Antipolo	Wading.
Do	Laguna Lake	Binangonan	None.
Do	Manga	Montalban	Wading.
Do	Morong	Morong	Weir.
Do	Panca	San Mateo	Bridge.
Do	Pililla	Pililla	Weir.
Tarlac	Camiling	Camiling	Bridge.
Do	Cutcut	Tarlac	Wading.
Do	Pamao	Banban	Do.
Do	Sapang Maragul	Capas	Weir.
Do	Tarlac	Tarlac	Wading.
Tayabas	Agos	Infanta	Boat.
Zambales	Nagsabaran	San Marcelino	Wading.
Do	Payotpot	Botolan	Do.
Do	Santa Fe	San Marcelino	Do.
Do	Tonton Lamun	Botolan	Do.
Zamboanga	Ayala	Ayala	Do.
Do	Balobo	Lamitan	Do.
Do	Bolong	Zamboanga	Do.
Do	Curuan	do	Do.
Do	Cubawan	Lamitan	Do.
Do	Layawan	Dipolog	Do.
Do	Maloso	Maloso	Do.
Do	Manioa-an	Zamboanga	Do.
Do	Mercedes	do	Do.
Do	Turaga	do	Do.

WATER RIGHTS.

The Division received during the year a total of 154 new applications for water rights, 142 of which were for irrigation and 12 for water power purposes. A total of 190 applications were considered, 110 of which were granted and 80 disapproved by the Secretary of Commerce and Communications, upon the recommendations of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 39,703 hectares of land. This makes the total number of applications granted for irrigation purposes, since the passage of the Irrigation Act No. 527 for irrigating 90,055 hectares of land. A total of 58 applications was pending advertisement and investigation at the end of the year.

Thirty water rights granted on 21 streams for developing a maximum of 16,411 horse-power are still in force, 17 rights for developing a maximum of 56,010 horse-power having been forfeited during the year for failure to effect the construction of power projects within the time allowed by law. There were 16 applications for water rights pending at the end of the year for developing a maximum of 102,028 horse-power on 16 streams. In this connection attention is invited to the recommendations submitted with a draft of the proposed act "to amend and compile the laws relative to the appropriation of public waters for the development of water power and the use of public lands in relation thereto, and for other purposes." The passage of this proposed law or similar legislation is recommended.

Complete adjudications of old water rights were made on 2 streams during 1920 making the total number of streams so adjudicated to date thirteen. These determinations involved 2,303 separate rights or parcels of land and affect the title to water for irrigating 8,486 hectares of land.

Surveys have been completed and maps prepared showing all water right locations on seven different streams. These surveys include 37,100 hectares of irrigated lands. The streams which have been surveyed and are now pending adjudication are given in the following table:

Stream.	Province.	Number of diversion ditches.	Length of main canals in meters.	Number of municipalities affected.	Approximate number hectares irrigated.
Pilar	Bataan	5	9,900	1	1,450
Calaguiman	do	11	10,600	1	500
Pansol	do	4	300	1	50
Talisay	do	16	18,650	2	800
Nayon	Pangasinan and Zambales.	20	29,520	2	1,200
Baliuag	Nueva Ecija and Tarlac	210	85,465	7	23,000
O'Donnell, Moriones and Tarlac.	Tarlac	1	4	7	10,100
Total area					57,100

Surveys are in progress with surveying parties in the field on the following streams:

Stream.	Province.	Municipality affected.	Approximate area of land irrigated in hectares.
Ange	Pampanga	Bacolor, San Fernando, Santa Rita and Porac.	1,200
Gogo	do	do	4,000
Buod	Pangasinan, La Union and Mountain Province.	Rosario, Baguio, San Fabian, Alaba, Benguet and San Jacinto.	5,136
Nagsincaoan	Ilocos Sur	Cabugao	300
Ubbug	do	do	200
San Jose, Anayan and Pauili Rivers.	Camarines Sur	Pili and Bula	4,000
Total area			14,836

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream.	Province.	Municipality affected.	Approximate area of land irrigated in hectares.
Masisi	Albay	Ligao and Oas	1,000
Ynarihan	Ambos Camarines	Naga, Nagarao and Cabalanga	1,200
Maoguingoguing	Ilocos Norte	Vintar	500
Balingasay	do	Sarrat	300
Lubnao	do	Vintar	300
Parasapas	Pangasinan	Tayug, Natividad	300
Basila	do	Rosales, Balungao and Umingan	2,000
Malabago (Ano or Anondaan) River.		Calasiao and Santa Barbara	1,000
Gogo and Bugo	Tarlac	Concepcion	1,000
Total area			7,600

RIVER CONTROL WORK.

The unusually heavy floods experienced in Luzon during 1920 have again demonstrated the necessity for constructing flood control works on many of the larger streams which during floods have been a menace not only to agriculture but to the lives of people in the districts affected. On such rivers as the Rio Grande de Pampanga, Tarlac and Agno Rivers, extensive investigations and surveys are necessary for the preparation of comprehensive plans for control works; and, since sufficient personnel was not available in the Division for this work, special authority was granted for accomplishing the work under contract with Mr. C. C. Wrentmore, a Consulting Engineer, with eleven years experience in the Philippines. Mr. Wrentmore's contract provides that he shall make the necessary investigations and topographic surveys in a period of two years and furnish preliminary general plans for control works and estimates of cost. He will receive ₱50,000 for the work, ₱36,000 to be paid in monthly installments of ₱1,500 from July 1, 1920, to June 30, 1922, and ₱14,000 upon the submission of his final report with plans and estimates. The Division prepared plans for six river control projects during the year in the Provinces of Pangasinan, Tarlac, Pampanga and Batangas which are being constructed by district engineers. In addition to the investigations being conducted by Mr. Wrentmore, the Division is making investigations of the Binalbagan River control project in Occidental Negros and the Toboy and Bued River projects in Pangasinan.

WATERWORKS.

During the year 1920, the activities of the waterworks section were confined largely to work on systems begun during 1918 and 1919. Considerable difficulty was experienced in procuring pipe and machinery, in some cases more than one year having elapsed between the time of placing the order and receiving the material.

Three new waterworks were started during the year and 33 systems on which work was commenced in 1918 and 1919 are being finished. To date, 76 systems have been completed in the Islands. There are 76 new systems in 29 provinces proposed for construction which will be accomplished as rapidly as the Legislature provides funds therefor.

Waterworks projects completed to date furnish potable water to a total population of about 250,000 and have cost approximately ₱2,000,000 while projects under construction will supply a population of 110,000 at an estimated cost of ₱1,732,673. The 76 proposed systems contemplate supplying potable water to about 320,000 people at an estimated cost of ₱6,000,000.

The high prices charged in recent years for pipe, and the limited resources of the municipalities concerned have delayed the financing of large waterworks projects at Iloilo and several other towns for which data have been available. Act No. 2894 passed by the Fifth Philippine Legislature, authorizing provinces, municipalities, and chartered cities to issue bonds under certain conditions for public works projects should facilitate the financing of waterworks projects, but thus far, none of these branches of the Government have availed themselves of this law. The Bangued project in Abra province and the Santa Cruz and Majayjay projects in Laguna were, however, partially financed by bond issues authorized by Acts Nos. 2338 and 2773 respectively.

The status of all waterworks projects to date is shown in the following lists:

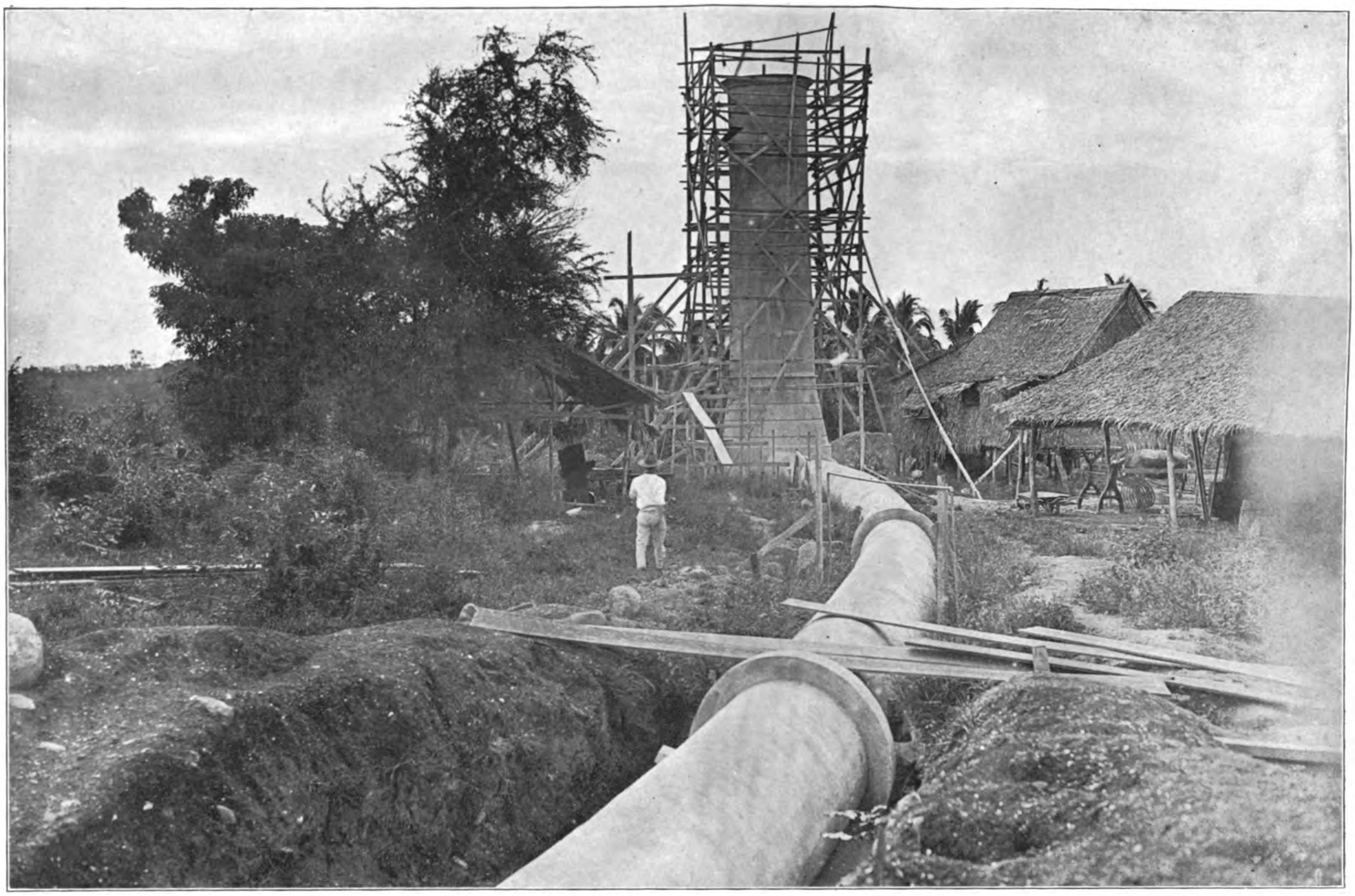
List (A).—New waterworks projects begun in 1920.
List (B).—List of waterworks projects under construction, exclusive of list (A).
List (C).—Waterworks projects completed.
List (D).—New waterworks projects.

LIST (A).—*Waterworks projects begun in 1920.*

Province.	Municipality.	Population to be served.	Estimated cost.	Insular allotment.	Municipal allotment.	System.
Abra	Bangued	5,500	₱101,000	₱50,000	₱40,000	Gravity.
Samar	Catbalogan	2,000	50,000	25,000	12,500	Do.
Tayabas	Mauban	3,500	40,000	25,000	12,500	Pump.
Total		11,000	191,000	100,000	65,000	

LIST (B).—*Waterworks projects under construction exclusive of list (A).*

Province.	Municipality.	Type of system.	Population to be served.	Estimated cost.	Insular allotment.	Municipal allotment.
Antique	San Jose	Pumping	3,000	₱41,000	₱26,667.00	₱15,436.59
Batangas	Batangas	do	6,147	72,125	43,600.00	27,768.68
Do	Lemery	do	7,200	42,000	25,000.00	15,411.19
Do	Lipa	do	5,000	90,000	50,000.00	30,000.00
Do	San Jose	Gravity	4,000	46,300	23,000.00	11,500.00
Bohol	Tubigon	Pumping	4,800	30,850	20,000.00	10,000.00
Bukidnon	Malaybalay	Gravity	3,000	12,000	8,000.00	4,000.00
Cavite	Mendez-Nuñez	Pumping and hydro-electric.	1,280	48,000	33,333.33	18,000.00
Cebu	Carcar	Gravity	6,400	55,000	36,400.00	18,200.00
Do	Dalaguete extension.	do	1,333	50,000	5,000.00	2,500.00
Do	Dumanjug	Pumping	1,500	30,000	20,000.00	10,000.00
Do	Ginatilan	Gravity	1,600	13,800	9,000.00	4,800.00
Do	Malabuyok	do	1,200	15,000	10,000.00	5,000.00
Do	Opon	Pumping	1,200	28,000	10,000.00	5,000.00
Do	Poro	Gravity	800	9,000	6,000.00	3,000.00
Do	Tudela	do	800	9,000	6,000.00	3,000.00
Davao	Davao	do	4,800	120,000	75,000.00	48,332.66
La Laguna	Santa Cruz	Pumping	6,000	70,000	46,667.00	23,333.00
Marinduque	Gasan	do	1,400	20,000	13,333.33	6,500.00
Do	Malbog	Gravity	1,000	15,000	10,000.00	5,000.00



Surge Tower, Zamboanga Hydro-electric Plant.

LIST (B).—*Waterworks projects under construction exclusive of list (A)*—Continued.

Province.	Municipality.	Type of system.	Population. to be served	Estimated cost.	Insular allotment.	Municipal allotment.
Mindoro	Abra de Ilog	Gravity	330	₱5,300	₱3,000.00	₱1,500.00
Misamis	Cagayan	Pumping	3,000	33,000	22,000.00	11,000.00
Mountain Province.	Apayao	do	800	7,000	5,000.00	2,500.00
Do	Baguio	Pumping and gravity.	5,000	130,000	90,000.00	37,500.00
Do	Cervantes	Gravity	800	4,000	2,667.00	1,350.00
Do	Trinidad	do	1,500	30,000	30,000.00	
Oriental Negros.	Dumaguete	Pumping	4,000	48,600	30,000.00	15,000.00
Pampanga	Arayat	Gravity	3,840	13,200	8,800.00	4,400.00
Sorsogon	Bacon	do	3,200	21,000	14,000.00	7,000.00
Surigao	Gigaquit	do	2,500	7,500	5,000.00	2,500.00
Tayabas	Lucban	do	3,200	45,000	25,000.00	15,000.00
Zambales	San Antonio	do	4,000	71,000	25,000.00	24,000.00
Zamboanga	Zamboanga	Gravity and hydro-electric.	4,375	309,000	75,000.00	203,570.68
Total			99,025	1,541,673	812,467.66	592,102.80

LIST (C).—*Waterworks projects completed.*

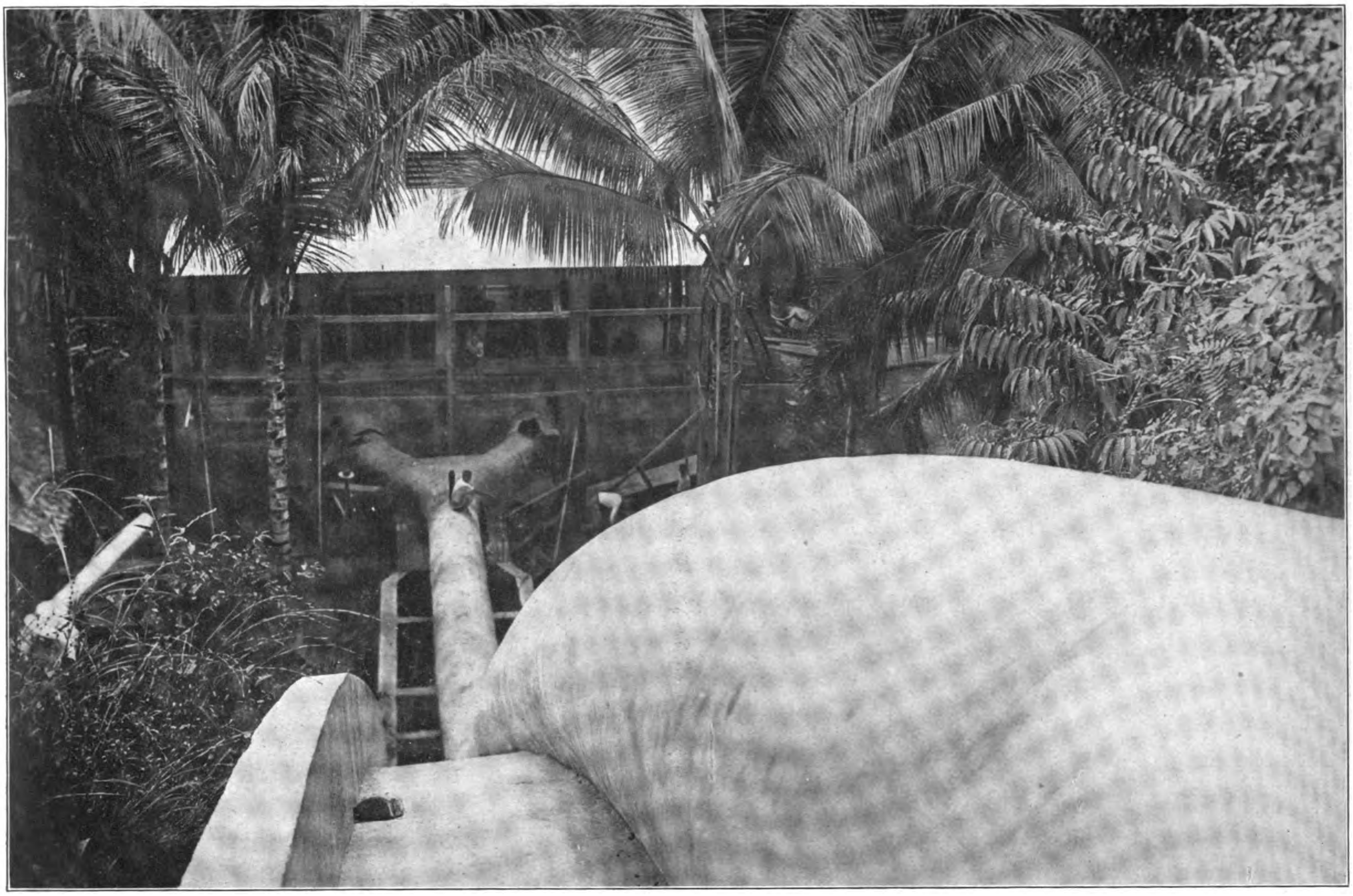
Province.	Municipality.	Population.	Cost.	System.	Remarks.
Albay	U. S. Reservation Regan Barracks.	(b)		Steam pumping	
Batangas	Balayan	2,000	₱7,333.92	Gravity	
Do	Cuenca	2,500	5,000.00	do	
Do	Taal	5,000	89,507.17	Pumping	
Bohol	Davis	840	5,100.00	Gravity	
Do	Duero	2,000	10,431.71	do	
Do	Jagna (a)	2,400	20,042.73	do	
Do	Loay	2,400	15,308.85	do	

NOTE.—For reference of (a) and (b) see footnotes at bottom of p. 44.

LIST (C).—*Waterworks projects completed*—Continued.

Province.	Municipality.	Population.	Cost.	System.	Remarks.
Bohol	Tagbilaran	5,245	₱12,990.35	Pumping	
Bukidnon	Deliric	600		Gravity	
Do	San Luis	500	650.00	do	
Bulacan	Hagonoy (a)	690	6,503.22	do	
Capiz	Capiz	7,000	12,000.00	Gravity, circular concrete tank.	Originally 1864, reconstructed 1900, by Military Government.
Do	Romblon	2,300		Gravity	
Cebu	Barili	4,000	26,000.00	do	
Do	Catmon (a)	1,800	15,357.40	do	
Do	Cebu	40,000	437,757.77	do	
Do	Moalboal	3,000	15,000.00	do	
Do	Pilar (a)	1,000	9,000.00	do	
Do	Poro	800	9,000.00	do	
Do	Naga extension	2,000	4,500.14	do	
Do	Samboan	1,600	4,981.02	do	
Do	San Francisco	1,400	6,200.00	do	
Do	Sibonga	6,000	32,300.00	do	
Do	Tudela	800	8,659.90	do	
Cotabato	Parang	600	9,600.00	Hydraulic Ram	
Ilocos sur	Vigan	6,440	137,242.58	Gravity	
Isabela	Ilagan, tank construction.				
Laguna	Bay	1,471	2,797.21	do	
Do	San Pablo	7,000	85,550.75	do	
Do	Majayjay	3,200	37,179.05	do	
Do	Nagcarlang	2,500	32,858.33	do	
Do	Pagsanjan	4,044	73,782.67	Pumping	
Marinduque	Boac	1,000	6,653.00	do	
Do	Mogpog	1,280	10,535.69	Gravity	
Do	Santa Cruz	2,560	20,696.23	do	
Mindoro	Calapan	2,500	29,936.76	Pumping	
Misamis	Baciregasay	3,284	3,500.00	Gravity	
Do	Mahinog	5,727	6,000.00	do	
Do	Mambajao	14,446	30,000.00	do	
Do	Sagay	6,321	800.00	do	
Mountain Province.	Teachers' Camp and Country Club.	500	(d)	do	

NOTE.—For reference of (a) and (d) see footnotes at bottom of p. 44.



Concrete Penstock to power house. Zamboanga Hydro-electric Plant.

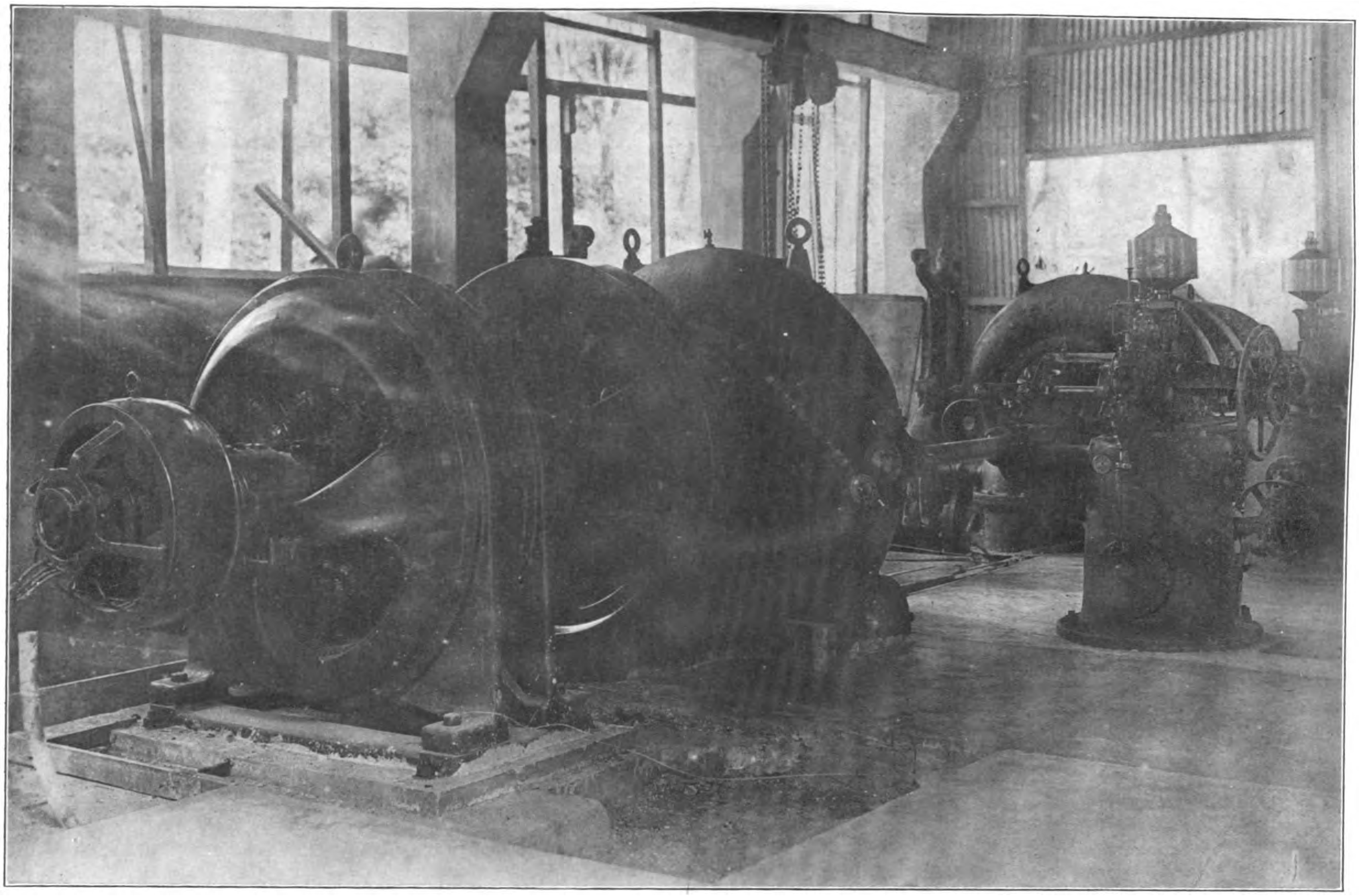
LIST (C).—*Waterworks projects completed*—Continued.

Province.	Muncipality.	Population.	Cost.	System.	Remarks.
Mountain Province.	Mansion House	100	(d)	Pumping	
Oriental Negros	Siquijor Poblacion.	1,587	₱18,000.00	Gravity	
Do	Barrio Siquijor	497		do	
Do	Luzurriaga	2,500	12,326.39	do	
Do	Talinting	2,890	5,025.00	do	
Do	Basac	265		Hydraulic ram	
Do	Maria	1,121		Gravity	
Do	Lasi	2,300	6,980.77	do	
Palawan	Puerto Princesa	1,600	25,000.00	Pumping	
Do	Coron	1,000	4,800.00	do	
Pampanga	Angeles	6,708	2,600.00	Steam pumping	
Do	San Fernando	100	(e)	Pumping	
Pangasinan	Bayambang	1,500	3,280.62	Gravity	
Do	Dagupan	(c)	2,823.02	do	
Do	Lingayen	(c)	3,938.99	do	
Do	Lingayen	(c)	9,141.22	do	
Do	Mangaldan	(c)	635.53	do	
Do	San Fabian	(c)	682.87	do	
Do	Bani	2,000	12,022.27	do	
Rizal	Antipolo	2,250	23,299.07	Pumping	
Do	Pasig	10,000	40,000.00	do	
Samar	Oras	4,000		Gravity	Constructed by Military.
Sorsogon	Magallanes	3,500	8,000.00	Pumping and gravity.	
Do	Sorsogon	250	1,044.67	Pumping	Municipal Building.
Sulu	Jolo	722	76,905.29	do	
Surigao	Bacuag	3,944	7,500.00		
Do	Lianga	2,032	1,924.58	Gravity	
Do	Placer (a)	1,200	13,436.17	do	
Tayabas	Lucena (a)	7,500	234,390.57	do	
Do	Tayabas (a)	4,600	125,159.36	do	
Do	Sariaya	6,000	37,935.00	do	
Zambales	Subic	1,628	12,400.00		

(a) Completed, 1920. (b) Variable. (c) Market or School. (d) Not available. (e) Unknown.

LIST (D).—*New waterworks projected.*

Province.	Municipality.	Estimated Cost.	Population.	System.
Albay	Guinobatan		12,300	No data.
Do	Albay and Legaspi	₱60,000.00	11,000	Pumping.
Do	Viga	15,000.00	3,316	
Batanes	Ivana	40,000.00	2,000	Gravity.
Do	Sabtang		748	No data.
Batangas	Balayan extension	1,500.00		Gravity from Balayan tank.
Do	Rosario	30,000.00	7,000	Pumping.
Do	Santo Tomas	28,000.00	1,310	
Do	Taal extension to Sambat and Buli.	18,000.00	2,105	Gravity from Taal tank.
Bohol	Antequera	9,000.00	2,600	
Do	Carmen	6,100.00	600	Gravity.
Do	Corella	6,000.00	1,019	
Do	Garcia-Hernandez	37,500.00	2,000	Do.
Do	Loon	30,000.00	4,000	Do.
Do	Mabini	6,000.00		Do.
Do	Valencia	20,000.00	1,435	
Bulacan	San Miguel	50,000.00	2,308	
Cagayan	Aparri	100,000.00	3,284	
Do	Lal-lo	15,000.00	996	
Do	Tuguegarao		4,562	No data.
Cavite	Cavite	200,000.00	8,298	
Do	Indang	42,000.00	2,000	Pumping.
Do	Silang	62,000.00	3,200	Gravity.
Cebu	Alegria	38,000.00	660	
Do	Asturias	92,000.00	1,086	
Do	Argao		2,000	Pumping.
Do	Balamban	40,000.00	2,113	
Do	Cordova		1,191	No data.
Do	Daanbantayan	7,500.00	579	
Do	Oslob	15,000.00	2,000	
Do	Osmeña waterworks extension.			Artesian wells.
Do	Pilar	6,000.00	800	Gravity.
Do	Ronda		1,526	No data.
Do	San Fernando	30,000.00	2,398	
Do	Tobogon		700	Do
Do	Talisay	30,000.00	2,000	Gravity.
Do	Tuburan	68,000.00	9,146	Pumping.
Cotabato	Cotabato	62,000.00	1,250	Ram and gravity.



View of pelton wheel and generators, Zamboanga Hydro-electric Plant.

LIST (D).—*New waterworks projected*—Continued.

Province.	Municipality.	Estimated cost.	Population.	System.
Ilocos Norte	Laoag	₱150,000.00	25,000	Gravity.
Ilocos Sur	Santa Lucia		1,908	No data.
Iloilo	Iloilo	2,500,000.00	51,000	Gravity.
Do	Pototan	295,000.00	5,672	Do.
Isabela	Ilagan		2,539	No data.
Laguna	Alaminos	12,000.00	1,127	Pumping.
Do	Calamba	30,000.00	3,463	Not decided.
Do	Lilio	9,000.00	2,238	
Do	Luisiana	34,000.00	1,808	
Do	Pila	9,000.00	2,171	
Do	Magdalena	45,000.00	1,811	Gravity from Majayjay.
Lanao	Dansalan		2,000	Hydro-electric.
Leyte	Baybay	15,000.00	6,000	Pumping.
Do	Burawen		3,038	Gravity.
Do	Liloan	7,500.00	792	
Do	Maasin	10,000.00	4,167	
Do	Tacloban		6,532	No data.
Manila	San Lazaro Hospital	45,000.00	2,000	
Do	School of Arts and Trades.	27,000.00	800	
Mindoro	Looc		1,623	Do.
Do	Caluya		1,477	Do.
Misamis	Misamis	66,000.00	1,564	
Mountain Province	Kabuyao		800	Do.
Do	Lubuagan	21,000.00	800	Gravity.
Marinduque	Torrijos	23,000.00	1,075	
Nueva Ecija	Cabanatuan	102,000.00	4,800	
Palawan	Bacuit	3,100.00	1,000	Do.
Do	Bintuan	4,500.00	1,000	Do.
Do	Cagayancillo		1,066	Rain water tank.
Do	Concepcion	3,600.00	600	Gravity.
Do	Cuyo	4,500.00	800	Pumping.
Pangasinan	Dagupan		4,436	No data.
Do	Malasiqui	30,000.00	2,613	
Do	San Manuel	24,000.00	3,500	Pumping.
Romblon	Looc	30,000.00	1,000	
Samar	Calbayog	20,000.00	5,907	
Sorsogon	Barcelona	22,000.00	2,285	
Do	Sorsogon		1,396	No data.
Sulu	Siasi		248	Do.
Surigao	Surigao	45,000.00	7,959	

CONVERSION TABLE.

One Peso (₱) = 50 cents, U. S. cy.
One kilometer (Km.)
One kilogram (kg.) = 2.20 pounds (lbs.)
One centimeter (cm.) = 0.39 inch
One meter (m.) = 3.28 feet
One hectare = 2.47 acres
One cubic meter (cu. m.) = 1.31 cubic yards
One hectare meter per day = 8.107 acre feet per day
One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) second feet

FINANCIAL.

LOANS FOR ROADS, BRIDGES, SCHOOLS, MARKETS, MUNICIPAL AND PROVINCIAL BUILDINGS, WATERWORKS, ETC.

FROM JANUARY 1, 1920 TO MARCH 31, 1920.

Province and project.	Act No.				Total.
	1323.	1729.	1749.	2625.	
Antique:					
Antique High School			₱5,000		₱5,000
Dao School	₱8,000				8,000
Batangas:					
Calaca Market			18,000		18,000
Cagayan:					
Tuguegarao Market		₱30,000			30,000
Aparri Market				₱40,000	40,000
Cavite:					
Carmona Municipal Building		8,000			8,000
Cotabato:					
Cotabato Market	20,000				20,000
Ilocos Norte:					
Piddig Municipal Building		15,000			15,000
San Nicolas School		10,000			10,000
La Union:					
La Union Agricultural School				10,000	10,000
Tarlac:					
Tarlac High School				115,000	115,000
Total	28,000	63,000	23,000	165,000	279,000

FROM APRIL 1, 1920 TO JUNE 30, 1920.

Province and project.	Act No. 1323.	Total.
Tayabas:		
Calauag School	₱20,000	₱20,000
Total	20,000	20,000

FROM JULY 1, 1920 TO SEPTEMBER 30, 1920.

	Act No. 1749.	Total.
Batangas:		
Batangas Water Works System	₱8,000	₱8,000
Camarines Norte:		
Daet Market	35,000	35,000
Capiz:		
Pontevedra Market	19,000	19,000
Pampanga:		
Porac School	10,000	10,000
Tarlac:		
Tarlac Municipal Building	13,000	13,000
Tayabas:		
Gumaca School	25,000	25,000
Total	110,000	110,000

FROM OCTOBER 1, 1920 TO DECEMBER 30, 1920.

Province and project.	Act No.				Total.
	2625.	1729.	1740.	1749.	
Bataan:					
Balañga School		₱25,000			₱25,000
Bulacan:					
Obando School				₱8,000	8,000
Camarines Sur:					
Iriga Market				8,000	8,000
Capiz:					
Capiz High School		73,500			73,500
Leyte:					
San Miguel School				2,500	2,500
Pangasinan:					
Umingan School				10,000	10,000
Gabaldon School				7,000	7,000
Rizal:					
Dampalit Bridge	₱30,000				30,000
Pasay School	40,000				40,000
Tarlac:					
Court House		10,000			10,000
Tayabas:					
Dolores School			₱9,000		9,000
Gumaca Municipal Building	25,000				25,000
Total	95,000	108,500	9,000	35,500	248,000

ANTIQUE.—For the purpose of purchasing and improving a site to be used as an athletic field, in connection with the present high school building in the Province of Antique, a loan of ₱5,000 is hereby granted that province, same to be payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of completing the construction of a modern school building, a loan of ₱8,000 is hereby granted the municipality of Dao, Province of Antique, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years respectively, from the date of the loan together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

BATANGAS.—For the purpose of assisting in the construction of a modren market building in the municipality of Calaca, Province of Batangas, an additional loan of ₱1,800 is hereby granted that municipality, payable in two equal annual installments due in nine and ten years, respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

CAGAYAN.—For the purpose of constructing a modern market building in the municipality of Tuguegarao, Province of Cagayan, a loan of ₱30,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of constructing a modren market building a loan of ₱40,000 is hereby granted the municipality of Aparri, Province of Cagayan, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

CAVITE.—For the purpose of completing the construction of a municipal building in the municipality of Carmona, Province of Cavite, a loan of ₱8,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

COTABATO.—For the purpose of constructing a modern market building, a loan of ₱20,000 is hereby granted the municipality of Cotabato, Province of Cotabato, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

ILOCOS NORTE.—For the purpose of assisting in the construction of four additional rooms to the present school building, a loan of ₱10,000 is hereby granted the municipality of San Nicolas, Province of Ilocos Norte, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of assisting in the construction of a modern municipal building, a loan of ₱15,000 is hereby granted the municipality of Piddig, Province of Ilocos Norte, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

LA UNIÓN.—For the purpose of assisting in the construction of an agricultural school building, a loan of ₱10,000 is hereby granted the Province of La Union, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

TARLAC.—For the purpose of constructing a provincial high school building, a loan of ₱115,000 is hereby granted the Province of Tarlac, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

TAYABAS.—For the purpose of constructing a school building in the municipality of Calauag, Province of Tayabas, a loan of ₱20,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

BATANGAS.—For the purpose of completing the installation of the Batangas Waterworks System, an additional loan of ₱8,000 is hereby granted the municipality of Batangas, Province of Batangas, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date the loan is released, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

CAMARINES NORTE.—For the purpose of purchasing a site and erecting a modern market building thereon, a loan of ₱35,000 is hereby granted the municipality of Daet, Province of Camarines Norte, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

CAPIZ.—For the purpose of constructing a modern market building, a loan of ₱19,000 is hereby granted the municipality of Pontevedra, Province of Capiz, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

PAMPANGA.—For the purpose of assisting in the completion of a school building, a loan of ₱10,000 is hereby granted the municipality of Porac, Province of Pampanga, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

TARLAC.—For the purpose of completing the construction of a municipal building, an additional loan of ₱13,000 is hereby granted the municipality of Tarlac, Province of Tarlac, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

TAYABAS.—For the purpose of assisting in the construction of a modern school building, a loan of ₱25,000 is hereby granted the municipality of Gumaca, Province of Tayabas, repayable in ten equal annual installments due in one, two three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per centum per annum.

BATAAN.—For the purpose of assisting in the completion of a school building, an additional loan of ₱25,000 is hereby granted the municipality of Balañga, Province of Bataan, repayable in eight equal annual installments due in three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

BULACAN.—For the purpose of assisting in the construction of a modern school building, a loan of ₱8,000 is hereby granted the municipality of Obando, Province of Bulacan, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

CAMARINES SUR.—For the purpose of assisting in the completion of a modern market building, a loan of ₱8,000 is hereby granted the municipality of Iriga, Province of Camarines Sur, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

CAPIZ.—For the purpose of assisting in the completion of a High School building, a loan of ₱73,500 is hereby granted the Province of Capiz, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan together with interest, payable quarterly, at the rate of 4 per centum per annum.

LEYTE.—For the purpose of assisting in the construction of a school building, a loan of ₱2,500 is hereby granted the municipality of San Miguel, Province of Leyte, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

PANGASINAN.—For the purpose of assisting in the construction of an addition to the present school building, a loan of ₱10,000 is hereby granted the municipality of Umingan, Province of Pangasinan, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of assisting in the completion of a Gabaldon school building, a loan of ₱7,000 is hereby granted the municipality of Natividad, Province of Pangasinan, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

RIZAL.—For the purpose of constructing a school building in the municipality of Pasay, Province of Rizal, a loan of ₱40,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of constructing a bridge across the Dampalit River, a loan of ₱30,000 is hereby granted the Province of Rizal, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

TARLAC.—For the purpose of purchasing a suitable site for a Court house, a loan of ₱10,000 is hereby granted the Province of Tarlac, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

TAYABAS.—For the purpose of assisting in the construction of a school building, a loan of ₱9,000 is hereby granted the municipality of Dolores, Province of Tayabas, repayable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per centum per annum.

For the purpose of constructing a municipal building in the municipality of Gumaca, Province of Tayabas, a loan of ₱25,000 is hereby granted that municipality, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine and ten years, respectively, from the date of the loan, together with interest thereon, payable quarterly, at the rate of 4 per centum per annum.

APPENDIX A.

CIRCULAR LETTERS ISSUED BY THE CONSTRUCTING DIVISION FROM JANUARY 1 TO DECEMBER 31, 1920.

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
BUREAU OF PUBLIC WORKS
CONSTRUCTING DIVISION
MANILA, P. I.

MANILA, *January 14, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 29.

Subject: New Explosives Licenses.

SIR: This Office has been advised that many requisitions for explosives are being held up in the Bureau of Supply due to the fact that the requisitioners have not secured the necessary licenses for the use of said explosives.

As the Federal Explosives Regulations have been revoked by the United States Congress, all licenses issued to persons under the abovementioned Act, should be sent to the Chief of Constabulary at the earliest possible date, for cancellation.

Person now holding or who formerly held Federal Explosive Licenses for the use of explosives, and who desire to continue the use of said explosives, should, if not already in possession of explosives license as provided by Act No. 2255 of the Philippine Legislature, immediately submit to the Provincial Commander of Constabulary, if a resident of a province, or the Chief of Constabulary, Manila, if a resident of Manila, application for a permit to possess such explosives as they have on hand or may desire to purchase. Blank forms for this purpose have been furnished to all Provincial Commanders of Constabulary.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *April 16, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 30.

Subject: Guard Rails on Bridges.

SIR: It is with grief that I have to inform you that owing to the narrowness of the road and the absence of guard rails on the Manaoag collapsible bridge in the Province of Pangasinan, cashier Norada of the Bureau of Public Works, Baguio division, and driver Labrador of the Benguet Automobile Line, were killed on the 7th instant, when the automobile in which they were riding fell into the river. May they rest in eternal peace! A similar accident occurred last month on the Naguilian collapsible bridge on the Naguilian Road to Baguio.

In view of the foregoing accidents, your attention is invited to the necessity of providing all bridges with substantial guard rails, in order to avoid similar accidents in the future.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *June 19, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 31.

Subject: Bulletin Notes and Quarterly Progress Report Combined.

SIR: Hereafter "Bulletin Notes" are to be submitted with and as a part of the Quarterly Progress Report required by memorandum dated July 17, 1919. In other words: compile your notes, observations and illustrations which you have hitherto been making for the Quarterly Bulletin, in conjunction with and applicable to your Quarterly Progress Report. Such notes and report will not as a rule be published entirely; only selected portions thereof will be published. Photographs must be sent in unfolded and loose, i. e., not clipped together. The legend must not be written on the face of the photograph but on a piece of paper to be pasted on its lower back.

Articles on special subjects will always be welcome.

Your Quarterly Progress Report should therefore cover each and every project. In addition, graphic forms are submitted as per attached samples, which must be accomplished for roads and bridges with your Quarterly Progress Report. Additional sheets of this graphic form may be requisitioned as required from time to time.

If the kilometer numbering given on the road form does not agree with the numbering on your roads, same may be changed to fit your roads. This form should not be mistaken for the road diagram which you submit semi-annually for the entire lengths of the various classes of roads in your province. It must be accomplished only for roads under construction, whether first-class, second-class, third-class or trail construction, and and must show nothing more than the amount of work done during each quarter, (the sections finished in 1919, for instance, need not be shown on the reports for 1920). Use one sheet for each road and each bridge project. If some road projects are of short lengths, two of them may be reported on one sheet by properly adjusting them to the two sets of lines given. Use the space given below each diagram for remarks or description of the projects.

Your Bulletin Notes and Quarterly Progress Report will be referred to hereafter as your *Quarterly Progress Report*, which is to be submitted on or before the 10th day of April for the preceding quarter, on or before the 10th day of July for the preceding quarter, on or before the 10th day of October for the preceding quarter, and on or before the 10th day of January for the preceding quarter.

All previous circulars and instructions in conflict herewith are hereby revoked.

NOTE: The report for the first and second quarter combined, ending June 30, 1920, is to be submitted in accordance herewith.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *June 22, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 32.

Subject: Signature.

SIR: All signatures not being easily read at a glance, the practice of typing your name immediately below your signature is to govern in the future, as per signature herewith.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *July 2, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 33.

Subject: Record of Cost of Supplies.

SIR: It has been brought to the attention of the undersigned that many district engineers do not keep systematic records of cost of the supplies they purchase, which causes them considerable trouble and loss of time in getting up an estimate of cost of proposed new projects.

The trouble and delay in getting up an estimate is more noticeable when a new district engineer takes over a district. Being unfamiliar with conditions in the district and there being no available systematic record of cost of supplies purchased, when requested to get up an estimate for a new project, his only resource is to ask his foremen, clerk, or look up all the correspondence on file in the district. This method of procedure, besides being unsatisfactory and inaccurate, does not reflect favorably upon any modern engineering organization such as the district engineer's office.

In order to avoid all these troubles and bring every district engineer's office up to a modern business standard, it is directed that a system of recording the cost of important supplies be estblished at once in your office.

One of the clerks in your office, preferably the property clerk, should be given charge of this work in addition to his regular duties.

One of the most simple and expenditious methods of keeping cost data records of supplies purchased is by means of cards, as shown in the enclosed sample. These cards may be of bristol board, filed in an open box, alphabetically arranged and suitably separated by means of guide card for every important class of material purchased, such as lumber, cement, reinforcing steel, roofing iron, etc.

For the Director:

Marcial Kasilag,
Acting Chief Constructing Engineer.

Manila, *July 9, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 34.

Subject: Delay of Requisitions.

Sir: Your attention is invited to the following communication received from the Purchasing Agent:

"June 25, 1920.

"Sir: We have of late received several requisitions from the different district engineers for road roller, automobile, truck, and engine parts, oils, etc., but, for lack of complete descriptions, we were unable to fill them without first securing the necessary information from the respective requisitioners. It is, therefore, requested that, to avoid delays in the filling of requisitions for these items, district engineers be instructed to estate, in all cases, the engine number of the road roller for which the parts are desired; the model, in the case of automobiles and trucks; the horse power, in the case of engines; the kind or purpose for which to be used, in the case of oils, etc. By giving such information in the requisitions, delays in the filing of requisitions for these items will be minimized, if not entirely avoided.

Very respectfully,

(Sgd.) C. E. Unson,
Purchasing Agent.

The Director of Public Works,
Manila."

Compliance with these instructions in submitting requisitions will be expected.

For the Director:

Marcial Kasilag,
Acting Chief Constructing Engineer.

Manila, *November 4, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 35.

Subject: Provincial Annual Road and Bridge Budget.

Sir: Not later than the *15th day of November* your recommendations relative to the estimated revenues and proposed expenditures of road and bridge funds for the ensuing year, using the attached model form as your guide, should be forwarded to this office for approval. Insular allotments, whether regular or special, should never be included in your estimate as the availability and amount of same are uncertain, as set forth in the Provincial Circular Unnumbered quoted hereunder:

PROVINCIAL CIRCULAR (UNNUMBERED)

"*Subject*: Provincial Road and Bridge Fund.

October 23, 1920.

In the preparation of provincial budgets, it is requested that hereafter no amount of Insular allotment be included therein, unless the amount has actually been allotted. This is necessary in view of the fact that Insular allotments are not a fixed amount for every year, its amount depending upon the appropriation made from year to year by the Philippine Legislature.

(Sgd.) Ped. J. Rich,
Acting Chief Executive Bureau.

To all
Provincial Boards and
Provincial Treasurers of the provinces under the jurisdiction of the Executive Bureau."

This office will, hereafter, assign the Regular Allotment only to a project or projects needing it the most.

You will note in said model that the major portion of the total estimated revenue goes to the maintenance of first class roads and important road construction projects. However, it must always be borne in mind that maintenance precedes construction. This means that only after the estimated cost of maintenance has been entirely covered will construction projects be considered in the matter of appropriation. In this connection your attention is specially invited to section 2113, paragraph (*a*) of the Revised Administrative Code, which should be brought to the attention of your provincial board in submitting your estimate of expenditures.

Upon the return of the proposed budget approved by the central office, and not later than the *15th day of December*, same should be submitted to the Provincial Board for their action. Upon the passage of the annual budget, whether in accordance with wour recommendation or not, a copy thereof together with the resolution of the Provincial Board approving same must be forwarded to this office.

For the Director:

Marcial Kasilag,
Acting Chief Constructing Engineer.

PROVINCIAL ANNUAL ROAD AND BRIDGE BUDGET

Province of ....

ESTIMATED REVENUE.

[To be obtained from the Provincial Treasurer's Office.]

Balance January 1, 1920	₱43,329.27
Cedula taxes	50,000.00
Internal revenue allotment	21,653.76
Real property tax	33,350.00
Receipts from land transportation	3,500.00
Receipts from tool, ferries and bridges	30,900.00
Miscellaneous	14,250.00
Total	₱196,883.03

MAINTENANCE ESTIMATE

Name of project.	Total expenditure, 1920.	Estimated expenditure, 1921.
Maintenance of first class roads		
Maintenance of second and third class roads		
Maintenance of trails		

PROPOSED EXPENDITURES.

Proj. No.		
M-40-1	Maintenance of first class road	₱100,000.00
M-40-2	Maintenance of second class road	5,000.00
M-68-3	Construction of Albay-Sorsogon Road	40,000.00
M-68-4	Reconstruction of Guinobatan-Jovellar Road	10,000.00
M-60-5	Construction and reconstruction of Polangui-Libon Road	5,000.00
M-19	Interest payments	2,000.00
M-57	Repayments of loans	15,000.00
M-10	Operation of land transportation	3,000.00
M-16	Operation of tool, ferries and bridges	2,000.00
M-81	Motor vehicles and accessories	3,000.00
M-82	Land transportation equipment	500.00
M-83	Industrial machinery and implements	2,000.00
M-84	Hand tools	3,000.00
M-86	Miscellaneous equipment	200.03
	Balance unappropriated	6,183.00
	Total	₱196,883.03

MANILA, *July 25, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 36.

Subject: Annual Report.

SIR: Your Annual Report is to be submitted on or before the 15th day of January each year.

A general form for this report, a sample of which is enclosed for you, is to be submitted for every project, the estimated or actual cost of which is ₱10,000 or more excepting Maintenance Projects. Maintenance Projects may be reported in the same way or treated specially if so desired.

Under Column No. 1 be sure to indicate whether the project is a Municipal, Provincial or Insular Project.

Column No 3. Give the total estimated cost of the project. If the project is divided by Contracts into different parts, show the estimated costs for each part.

Column No. 6. This column is intended to show all previous expenditures together with the current year's expenditures and obligations. If the total expenditure exceeds the estimated cost or is considerably less, note the reasons for the discrepancy in the description of the project. If the obligations show more than 20% of the total, explain why.

Column No. 9. Show the date the project was completed, and if not completed, the percentage of the work done at the end of the year.

Under *Complete Description*, described the project fully, and if desired, sketches, photographs or drawings may be attached to the sheet pertaining thereto. Explain in detail the purpose for which the project was authorized and the public benefit to be derived therefrom, making this feature so clear and intelligent that the most backward of the general public will readily understand it.

If the project is not completed, show the status at the end of the year and note when the project may be expected to be completed. If delayed, give reasons for the delay.

Report one project on one sheet only, and if there is not sufficient room on the face of the report sheet, use the back of the sheet to complete your descriptive notes of the project.

Any previous instructions in conflict herewith are hereby revoked.

Suggestions and recommendations from you are invited.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *July 27, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 37.

Subject: Requisition Number.

SIR: Many inquiries are being received by this office from time to time regarding the status of various articles requisitioned from the Bureau of Supply.

In many instances three or four days are consumed in locating this requisition at the Bureau of Supply and in a few cases it has been found impossible to locate same.

To avoid this delay you are requested, in making inquiries to this office, to always give the Bureau of Supply requisition number if same is obtainable. If Bureau of Supply requisition number is not available, give date of requisition and first item thereon.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *September 25, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 38.

Subject: Filing Applications for Vacation and Accrued Leave of Absence.

SIR: The following memorandum of the Director of Public Works is hereby quoted in full for your information and guidance:

"MANILA, *September 21, 1920.*

MEMORANDUM.

To all division chiefs:

It has been brought to the attention of the undersigned that some of the classified employees of this Bureau are availing themselves of the leave privileges without filing in proper time applications on Civil Service Forms 55 and 39 (vacation and accrued leave of absence) respectively, and consequently considerable number of days elapse before their applications are received in this office, and in some cases these employees disregard entirely the necessity of filing applications as contemplated by the Civil Service Rules and Regulations until their attention is particularly called thereto. It is directed that this practice be stopped at once.

All applications for vacation leave of absence for a period of one full day or more, must be made on the form provided therefor *five days* in advance, whenever possible. In case of illness or unavoidable absence from other cause, applications should at once be made on the first day they report for duty. When leave is granted and not taken or partly taken by the applicant, notice to that effect should be submitted to this office at once. If leave is taken for one *half-day* only, application form need not be made, but notice giving the particular date or dates of the month on which such half day absence has been made, should be submitted.

In this connection, attention is invited to the fact that employees who receive *probational appointments* and those who received appointment by *reinstatement*, are entitled to vacation leave granted by law, but payment for absences made during the six months from the date of probational appointments, or appointments by reinstatement, are being witheld until after that period when payment can be made on request. However, in any of the above cases, any absences not less than one day should be promptly covered by the regular application form, for the approval of the Director of Civil Service. (Sgd.) JOSE PAEZ, Director of Public Works."

Classified employees in your district, when desiring to take vacation leave, must submit to you their application for such leave five days in advance, if possible. Relative to the filing of application for accrued leave of absence, attention is invited to Bureau of Public Works General Order No. 29, dated December 21, 1912, which is still in full force and effect.

For the Director:

(Sgd.) MARCIAL KASILAG,
Acting Chief Constructing Engineer.

ANNUAL REPORT

Fiscal year 192...., 192.....

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Project title.	Project No.	Estimated cost.	Total appropriation.	Total appropriation this year.	Total expenditure.	Total expenditure this year.	Date work started.	Date and percentage completed.

COMPLETE DESCRIPTION.

MANILA, *September 18, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 39.

Subject: Manner of Coursing Requisitions Prepared by District Engineers.

SIR: Your attention is invited to Executive Bureau Provincial Circular No. 182, dated September 7, 1920, which reads as follows:

"THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF THE INTERIOR
EXECUTIVE BUREAU
MANILA

September 7, 1920.

PROVINCIAL CIRCULAR NO. 182.

Subject: Manner of Coursing Requisitions Prepared by District Engineers.

It is requested that requisitions prepared by District Engineers, after being certified by Provincial Treasurers as to funds available for payment of the materials called for, be returned to the District Engineer concerned who will mail the requisitions direct to the Bureau of Public Works for an accurate check before they are sent to this office for approval.

Provincial Circular No. 17 of this office, dated March 31, 1913, which outlines the manner of coursing requisitions, is hereby amended accordingly.

(Sgd.) PED. J. RICH,
Assistant Chief, Executive Bureau."

Compliance with the provisions of this circular will be expected.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *October 1, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 40.

Subject: Resignation.

SIR: Attention is invited to the following memorandum of the Director of Public Works:

"MANILA, *August 27, 1920.*

MEMORANDUM.

To all division chiefs:

Hereafter all resignations of classified employees of this Bureau shall be accepted by the Honorable the Secretary of Commerce and Communications upon the recommendation of the Director of Public Works, instead of as has been done heretofore.

Therefore, in case an employee is resigning, the division chief under whom such employee is working, shall without any delay, forward letter of resignation to the office of the Director of Public Works, with proper comment and recommendation.

(Sgd.) JOSE PAEZ,
Director of Public Works."

You are directed to comply with the above memorandum in all resignations of classified employees in your district.

Separations of temporary employees from the service heretofore reported on Bureau of Public Works Form No. 4 shall continue to be reported in the same form.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *October 4, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 41.

Subject: Progress Report on Interprovincial and Intercoastal Roads.

SIR: The attached progress report should be submitted at the end of each month for all interprovincial and intercoastal roads in your district given a special insular allotment, as well as for roads financed solely with insular funds.

Your foreman in charge ought to be able to fill this out, and your chief clerk can fill in the appropriation and expenditure items.

For the Director:

(Sgd.) MARCIAL KASILAG,
Acting Chief Constructing Engineer.

[For blank form see Revised Monthly Progress Report attached to Supplementary Constructing Division Memorandum No. 41.]

MANILA, *October 20, 1920.*

SUPPLEMENTARY TO CONSTRUCTING DIVISION MEMORANDUM NO. 41.

SIR: We are sending you herewith blank form of Revised Monthly Progress Report for interprovincial and intercoastal roads in your district. The instructions contained in Constructing Division Circular No. 41 should be heeded and progress report submitted to this office in due time.

Copies of this form may from time to time be requisitioned from the central office on the usual Bureau of Public Works Form No. 45-A.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MONTHLY PROGRESS REPORT

Province of.. **Month of**..

.... **Interprovincial road.**
.... **Intercoastal road.**
.... **Other roads financed solely with insular funds.**
Estimated cost.. ₱..................
Total appropriation to date.. ₱..................
Total expenditure to date.. ₱..................

Subgrade.	Surfacing.	Miscellaneous.
Grading completed, station..............to station..............	First course complete, station..............to station..............	
Do ....do..............do	......do ....do..............do	Depositories.
Do ....do..............do	......do ....do..............do	
Do ....do..............do	Second course complete, station..............do..............	
Do ....do..............do	......do ....do..............do..............	Finishing and sodding of shoulders.
Do ....do..............do	......do ....do..............do..............	
Do ....do..............do	Finishing course complete, station..............do..............	
Do ....do..............do	......do ....do..............do..............	Temporary and permanent bridges, etc,
Do ....do..............do	......do ....do..............do..............	

Earth.		Rock.		Gravel or rock.					Item in detail.	Cost.
Cubic meter.	Cost.	Cubic meter.	Cost.	Cubic meter.	Cost.	Kilometer haul.	Cost.	Spreading and rolling cost.		
Total cost ...										

Expenditure previous month.. ₱..................
Expenditure this month.. ₱..................
Balance on hand.. ₱..................

Approved:
....
District Engineer.

Prepared by:
....
Foreman in charge.

MANILA, *October 15, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 42.

Subject: Road Surveys and Estimates.

SIR: I have to invite your attention to the enclosed model form for the submission of preliminary road surveys and estimates. You are directed to submit any future road surveys and estimates to this Bureau for approval in accordance with the model herewith furnished.

Send in your plan and profile to the central office for approval before making your estimate. This will avoid making another estimate in case the grade line is changed.

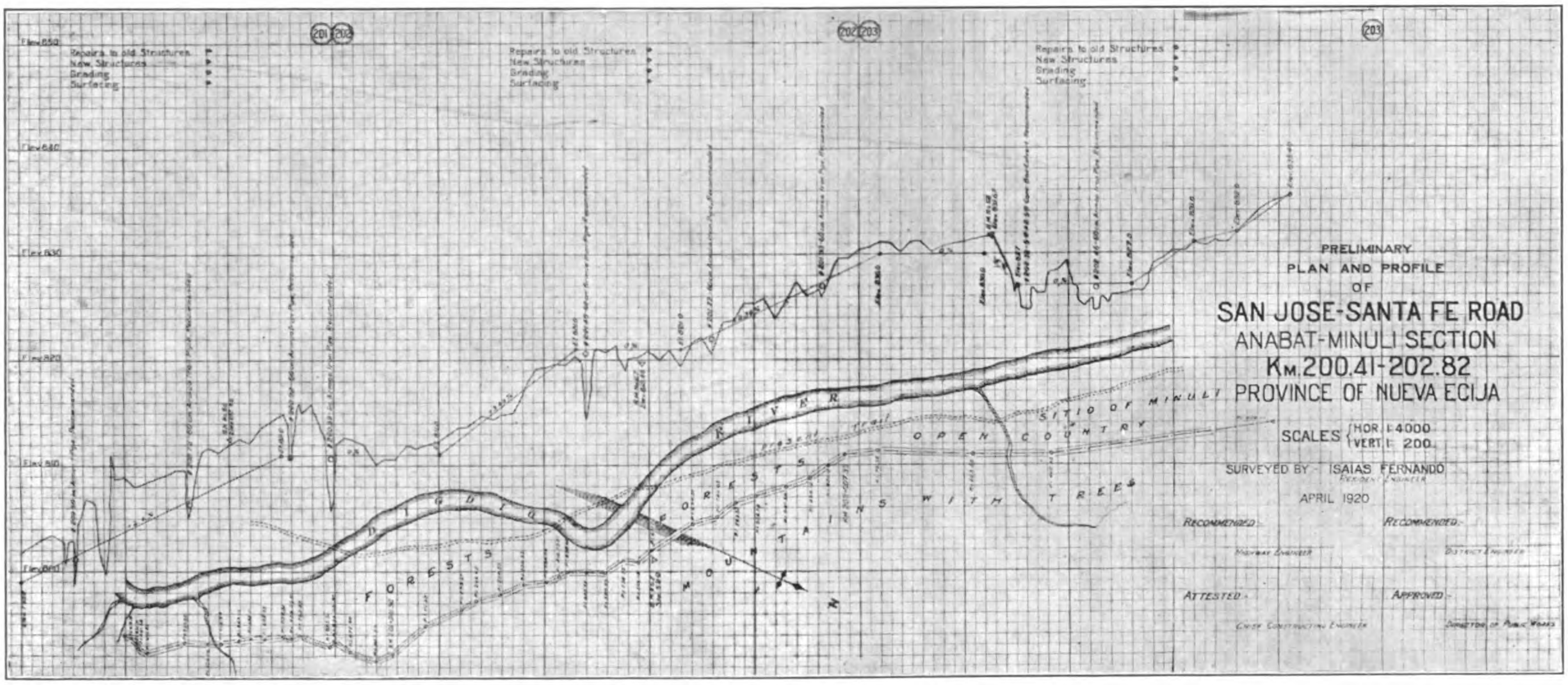
Please note that the final approved recapitulation of costs should be inked in for each kilometer on your plan as shown.

Do not ink in the grade line.

All instructions in the Engineer's Manual and Constructing Division Circular No. 170 and all others in conflict with this model form are hereby cancelled and revoked.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.



Model Plan and Profile for Road Surveys and Estimates.

ESTIMATE OF COST OF CONSTRUCTION OF
.... ROAD.

Province of...
Probable period of construction....................................., 192........, to.., 192........

KILOMETER No. ....

Class of metaling..; width, ... m.;
Depth, loose..................... cm. Average haul, ... km. Width of each shoulder, ... m. Daily wage for unskilled labor, ₱..........

Existing structures and road-bed.			Bridge and culvert construction.		
Bridge number.	Value.	Cost of repair.	Bridge number.	Dimensions.	Cost.
	₱	₱			₱
Road-bed					
Total repairs			Total construction		

GRADING.

Character.	Unit.	Number units.	Unit cost.	Total.
Right-of-way				
Clearing and grubbing				
Excavation and placing earth				
Excavation and placing rock				
Rolling sub-grade				
Depositories				
Total				

SURFACING.

Division of the work.	Unit.	Number units.	Unit cost.	Total.
Broken stone, at				
Crusher, screened ready to haul				
Gravel at gravel-pit, screened ready to haul				
Hauling and placing				
Rolling finishing kilometer post, signs, etc.				
Filling depositories				
Total				

RECAPITULATION OF COSTS.

Repairs to old structures	₱
New structures	
Grading	
Surfacing	
Provincial surcharge.......... Per cent	
Total	
Insular surcharge.......... Per cent	
Grand total	

MANILA, *October 7, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 43.

Subject: Road Surveys and Estimates.

SIR: Inclosed herewith are sample copies of Quarterly Report for market and school building construction required of this Bureau by the Chief, Executive Bureau, and by the Director of Education, respectively, and you are requested to submit these forms to this office for our transmittal to the offices concerned, at the end of each quarter, beginning with the third quarter of the current year, which ended September 30, 1920, for each market and each school building project in your district. These forms may be requisitioned from this office as required from time to time.

The forms are self-explanatory, but it may not be amiss to add herein a few remarks in regard to filling some of the columns in order to further illustrate the information desired by the Bureaus concerned

Type and size of structure.—Show under this column the type and principal dimensions of the building under construction. In the case of a school house, if on account of shortage of funds only a portion of the building is being erected, indicate said portion by sketching it, if practicable, under the column for "*Remarks,*" or by giving a brief description of same, if this is considered sufficient to convey the necessary information. If the building is of wood with galvanized iron roof, or only a temporary structure with nipa roof, these facts must be clearly stated. The kind of roofing used must be mentioned in all cases, and if it be galvanized iron, the gauge of iron must be noted. In the case of market, if timber is substituted for concrete columns, the commercial name of the timber used must also be noted. In either case, if standard plan is used without any alteration, such notations as above required are not necessary.

Estimate.—If the estimate is only for a portion of the structure shown on the plan, as is often the case with many school building projects, it should be so stated, otherwise it will be understood that the estimate is for the whole structure shown on the plan.

Appropriation.—Show under this column the sources of funds.

Contract or administration.—State if the project is done by contract or by administration. If by contract, give the name of the contractor and the amount of contract.

Remarks.—Give such other informatory statements as might be of interest and would lead to a complete understanding of the project under consideration.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *November 19, 1920.*

SUPPLEMENTARY TO CONSTRUCTING DIVISION MEMORANDUM NO. 43.

Subject: School and Market Building Reports.

SIR: In submitting your Quarterly Reports for schools and markets as required by Constructing Division on memoradum No. 43, dated October 7, 1920, you are directed to forward to this Bureau at the end of each quarter copies thereof in *triplicate* as follows:

School Building Report, 3 copies.
Market Building Report, 3 copies.

The above-mentioned quarterly reports should be prepared on separate sheets—that is, use one sheet for school and another sheet for markets, and in case one sheet is not enough for each report, use as many sheets as are required and number them serially as: page 1, page 2, page 3, etc.

This Circular should become a part of, and filed with, Constructing Division Memorandum No. 43.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

....REPORT

.........................*Quarter, F. Y.*

....
District Engineer.

Province of..

...., 192

Name of project.	Type and size of structure	Estimate	Appropriation.	Expenditure during the quarter.	Actual expenditure to date.	Liabilities.	Total expenditure and liabilities.	Balance (debit in parenthesis.)	Construction authorized, date.	Percentage of work completed.		Contract or administration.	Remarks.
										During the quarter.	To date.		

MANILA, *October 23, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 44.

Subject: Public Works and Public Improvements.

SIR: Executive Provincial Circular (Unnumbered) of May 18, 1920, is quoted hereunder for your guidance and cooperation in effecting the improvements contemplated.

"THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF THE INTERIOR,
EXECUTIVE BUREAU,
MANILA.

MAY 18, 1920.

PROVINCIAL CIRCULAR (UNNUMBERED).

Subject: Public Works and Permanent Improvements.

This office desires to hereafter emphasize the necessity of paying special and constant attention to activities in provinces and municipalities in connection with public works to the present and prospective financial ability and borrowing capacity of each province and municipality. With this end in view, the following requirements and suggestions are hereby prescribed and issued:

I. *Special Report.*—Provincial Treasurers are requested to submit to this Office as soon as possible a complete list of permanent improvements now owned by the province and each municipality under their respective jurisdiction, or existing therein, including administration, school, jail, hospital or dispensary and market buildings; slaughterhouse, market tables and tiendas; permanent midden sheds in the market school and administration building sites: water sewer, lighting, telephone, and irrigation systems; cemetery; improved parks or plazas, and side-walks; with a statement for each regarding: (*a*) year constructed; (*b*) materials of which constructed; (*c*) total cost; (*d*) present conditions; (*e*) adequacy or inadequacy to present needs; (*f*) whether insured and for what amount, and (*g*) a statement if there is a plan for improving or enlarging the same.

II. *Future plans.*—Provincial treasurers are requested, after conferring with the authorities concerned, to submit to this office the plans of the municipal councils or provincial boards concerned for the next three to ten years regarding public works and permanent improvements to be undertaken, considering the present and future financial conditions and the borrowing and paying capacities of the province or municipality, and expressed willingness of the people to contribute to the cost of the improvements, if any; expected increase in the revenues in future years, *and giving preference, other conditions being equal, to revenue producing projects,* rather than to revenue consuming ones. Such plans, unless objected to by this office at the opportune time, should be adhered to as much as possible in the future.

III. *Executive Bureau's policy.*—This office believes that every municipality should be provided with all of the improvements mentioned in paragraph I hereof, and more, but realizing that only a few municipalities are financially able to acquire them all at once, a gradual, progressive, but permanent policy is, therefore, necessary. This office specifically acts upon all public works projects to be constructed in a province or municipality out of loan funds in whole or in part. Upon taking action on these matters the following considerations are given due weight:

(*a*) Necessity for the contemplated project and advisability of constructing it before other projects in the same locality.

(*b*) Whether it is a revenue-producing or revenue-consuming project. Under similar circumstances this office believes in the following order of development in a municipality.

1. Market buildings, tiendas and slaughterhouse for all municipalities not having now modern improvements of these kinds, if their construction would be a paying proposition.
2. Irrigation, electric and water systems for all financially able municipalities, the geographical locations of which are such that an irrigation or water system may be established by gravity, deriving suitable water in sufficient quantity from a nearby hill or mountain, and those where hydro-electric power may be derived from a river or fall reasonably near the municipality. In connection with irrigation, attention is invited to Act 2755 allowing municipalities to build irrigation systems one-third of the cost, the remaining two-thirds to be borne by the Insular Government and authorizing municipalities to charge ₱2 per hectare of lands irrigated. For provincial irrigation projects, see Act 2753.
3. School buildings, athletic grounds and parks.
4. Administration or Presidencia buildings.
5. Parks.
6. Other projects.
7. Town planing (Inserted by the Bureau of Public Works).

(*c*) Whether the erection of the project under consideration *will add and out lessen the aesthetic beauty of the locality* in which erected, and the area of the site is ample. For required era of sites, see Provincial Circular No. 177.

IV. *Stability of adopted plans.*—This office would prefer to receive resolutions of municipal councils and provincial boards, showing their program of permanent improvements containing a proviso that once sanctioned by the Chief, Executive Bureau, such program may not be altered without the approval of this office. This is believed necessary to secure a stable and definite program of improvements in a given municipality.

V. *Full cooperation of Provincial Treasurers.*—In view of their knowledge of local conditions and experience gained in years of service, provincial treasurers are expected to cooperate to the fullest extent possible in the preparation by provincial boards and municipal councils of a definite permanent improvement policy. The opinions of the District Engineer, Division Superintendent of Schools, District Health Officer, Provincial Fiscal, Provincial Commander of Constabulary and District Auditor should be freely consulted by the authorities concerned, where it appears necessary, to the end that all possible contingencies in the future could be detected and anticipated.

VI. *Financing public works projects.*—One of the serious obstacles found by several municipalities in attempting to finance a permanent public works project is the lack of local appropriation or of paying capacity of the municipality. This is due to the fact that heretofore no fixed minimum amount is set aside yearly by municipal councils for public works, no matter whether actual construction may be undertaken during the year. It is, therefore, suggested that hereafter municipal councils set aside for some public works projects needed in the municipality the following percentages of their revenue:

	Per cent.
First class municipality	40
Second class municipality	35
Third class municipality	30
Fourth class municipality	25

If the above is adopted, similar to the practice now in vogue as to building fund of municipal school funds it surely will hasten the completion of a public works program of a municipality, as it will increase the paying and borrowing capacities of municipalities and a fixed minimum amount of revenues will be devoted to permanent improvement of real benefit to the people in general.

VII. *Transmission to Municipalities.*—Provincial Treasurers will transmit copies hereof to the municipalities in accordance with Provincial Circular No. 5 of this office.

(Sgd.) PED. J. RICH,
Assistant Chief, Executive Bureau.

To all PROVINCIAL BOARDS and
PROVINCIAL TREASURERS."

NOTE.—Article 7, page No. 3 of the above-quoted circular was inserted by this office, it is to receive your attention and earnest effort in preparing plans when asked for by the Municipal Councils for the future development of towns all over the Archipelago.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *November 3, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 45.

Subject: Trees Along Roads, Unnecessary Mutilation of.

SIR: Circular No. 64 of the Bureau of Posts is quoted hereunder for your information,

"The attention of all concerned is directed to the following sections of the General Instructions to all Supervising Linemen, dated December 15, 1919:

"SECTION 11. *Location of Poles with relation to shade trees.* The care and pruning of trees set out along public highways or those left upon the right of way by the district engineer for ornamental or other purpose, shall be subject to the District Engineer's supervision and direction; provided that the local representative of the Director of Posts may in emergency cases, where there is interference with the telegraph or telephone service, remove the interfering leaves or branches at a point adjacent to the interference without prior notice to the District Engineer."

"SECTION 13. *Trimming and cutting of trees.* In order to prevent interference with the wires, linemen must cut off so much of the branches of trees and undergrowth as endanger the telegraph wires. In such cases, however, linemen must exercise good judgment with a view to preventing the unnecessary injury or mutilation of trees, especially of shade or fruit-bearing trees. Linemen must particularly be careful in trimming or cutting trees on private property. Private property should be respected. Whenever possible, the owner's permission should be requested. Linemen should be in good terms at all times with the people along the line, so that in emergency cases they may readily get help in connection with the repair and maintenance of the lines in their sections or districts.

The Director of Public Works complains that he is constantly receiving reports from District Engineers regarding the mutilation of trees (planted along the roads) by linemen. It is alleged that some linemen hack all the branches that they think are in the way and thus destroy the beauty and usefulness of the trees that were planted and are being maintained at considerable cost to the Government.

The above-quoted sections are too self-explanatory to need further comment. Postmasters will, upon receipt of this circular, bring this matter to the attention of all section linemen stationed at their respective offices. Supervising Linemen will do the same and see that these instructions are strictly complied with. In their quarterly inspections of telegraph lines, Post-Office Inspectors will pay particular attention to this important matter, reporting to this office every case of unncessary injury or mutilation of trees along the roads.—(Sgd.) JUAN RUIZ, *Acting Director of Posts.*"

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *December 1, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 46.

Subject: Builder's Hardware and Plumbing Fixtures.

SIR: Immediately upon receipt of authority to proceed by *administration* with the costruction of any building, you are directed *to forward a requisition for the "Builder's Hardware" and for the "Plumbing Fixtures" mentioned in the specifications for said building.*

Prompt compliance with the provisions of this memorandum will enable the Purchasing Agent to purchase in the local market, or provide from his stock, or to place the order promptly in the United States, for the materials as specified. It is desired to *avoid substitutions* and to have the materials on hand as specified, when the building requires them. This requisition may be submitted separately from that for the rest of the materials of the building, if you so desire.

Every contractor, as soon as his contract is signed, should order these materials *at once* from the United States, unless same can be obtained in the local market, in order not to have his contract time extended because of delay in the delivery of such materials, and you are directed to so notify him. Extension of contract time due to failure of contractor to order materials on time, will not be favorably considered.

The intention of the above is that there be sufficient time for the Bureau of Supply to fill the requisition *in full* or *in part* from their stock precisely as specified (*no substitutions*) and the balance of the items, *exactly as specified*, will be obtained by the Bureau of Supply calling for proposals in Manila or by the Bureau of Supply importing all of the items in full or in part as they may see fit, after referring proposals to the Bureau of Public Works for recommendation. In all cases (where importing is necessary) the question of time will be officially taken up between this Bureau and the Bureau of Supply.

Constructing Division Memorandum No. 9, dated May 7, 1918, is hereby revoked.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

MANILA, *December 4, 1920.*

CONSTRUCTING DIVISION MEMORANDUM NO. 47.

Subject: Funds for Bridge Projects.

SIR: This Office is constantly receiving bridge data sheets, Bureau of Public Works Form No. 38, when no funds are available for the project.

A detailed statement of the funds available should be submitted under paragraph twenty-eight (28) of the above-mentioned form.

No action will be taken by this office on any bridge data submitted unless funds are available for same.

For the Director:

MARCIAL KASILAG,
Acting Chief Constructing Engineer.

APPENDIX B.

PROJECTS ACTIVE APRIL 1, 1920.

Provinces	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	5	3						1												2											2		3	16
Agusan	5	4																		3				1		1					1		8	23
Albay	3	4		1						1			1																				1	11
Ambos Camarines	5	3				1	1			1			4						1	6	1			3	1	1	1						3	32
Antique	6	2																		2				1				1						12
Bataan	2	4					1				1				1					2						2							2	15
Batangas	4	4								1							1		1	3	1			4	1	1		6					11	38
Benguet	3	6									1		1												2	1		3				1	1	19
Bohol	6	3		1					1								1			7				2	1	3		5					4	34
Bukidnon	3	2																		1						1		1			1			9
Bulacan	5	4		3	2															5								1					5	25
Cagayan	4	2											1							2							1						5	15
Capiz	5	2		1	1								1							3							1						1	:5
Cavite	3	2			1															4				2		1		2						15
Cebu	7	2		1					1				1							5				1	2	4		10					22	56
Cotabato	5	2		1	1															1				1			1				1		6	19
Davao	6	3			1								1				1			2				1	2	2	1	1			2		13	36
Ilocos Norte	3	3							1									1		6			1		1								3	19
Ilocos Sur	6	3														1				4						2	1				1		3	21
Iloilo	15	3	1		3															1				1		4					1		4	33
Isabela	4	2							1				2							8													3	20
La Laguna	3	2	1					1	1				2		1					7				2		1		5					1	27
Lanao	4	3		1		1														5				1							2		7	24
La Union	5	3									1									6				1									1	17
Leyte	5	2							1		1		5					1		5		1		3									3	27
Manila																				3						16							60	79
Mindoro	3	3								1										1	1				1	1		3			1		1	16
Misamis	12	3		1	5															1				1				1					3	27
Mt. Province	8	12			2						2		5							2				2		2		2			1	1	10	49
Nueva Ecija	8	2			1								1							2													2	16
Nueva Vizcaya	5	4																		4		2					1				1		2	19
Occidental Negros	10	2			1																						1						1	15
Oriental Negros	4	4		1				1		1										3								2					3	19
Palawan	5	1																						1		2		3			4		2	18
Pampanga	6	6											1							7						1		1					2	24
Pangasinan	9	3			3				1				2							7			4	2		2							2	35
Rizal	5	3			2						1									1													2	14
Romblon	3	1									1									3		1											3	12
Samar	4	3																		2				1									3	13
Sorsogon	6	3						1	1				1							2		1		1				1					2	19
Sulu	1	2																		2						3		1			2		8	19
Surigao	2	2									1									4						2		4					2	17
Tarlac	4	3											3							1						1								32
Tayabas	4	4												1						4				1	3			7					15	19
Zambales	4	2																		2	2					1		1			1			13
Zamboanga	5	5								1										4				1	2							1	7	263
Total	230	141	2	11	23	2	2	4	8	7	8		32	1	2	1	3	2	2	145	5	5	5	34	16	55	8	61			21	3	240	1,079

NOTE.—Of the 240 projects under the caption "Miscellaneous," there are 10 surveys and investigations of roads, bridges, water supply, irrigation systems, hydrographic, etc., 3 docks, 40 artesian wells, 10 port works maintenance, 3 harbor maintenance projects, 11 irrigation systems, 13 wharves, 4 river control projects, 2 custom houses, 3 dredgings, 2 dykes, 2 boundary monuments, 24 constabulary buildings, 5 irrigation ditches, 2 water tanks, 17 hospitals and 2 monuments.

APPENIX C.

PROJECTS ACTIVE JULY 1, 1920.

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	6	3						1												2											2		2	16
Agusan	5	4																		3				1	1	1					1		6	22
Albay	4	4								1			1																				1	11
Ambos Camarines	5	3				1	1			1			3						1	6	1			3	1	4	1						2	33
Antique	6	2																		2				1				1						12
Bataan	2	4	1								1				1					3						1							2	15
Batangas	6	4								1						1			1	3	1			3	3	1		6				2	11	43
Benguet	3	2													1										2	1		2				1	1	13
Bohol	6	3		1					1		1						1			7				2	2	1		5					4	34
Bukidnon	3	2																		1						1		1			1			9
Bulacan	7	5			2															5			4			2		1						26
Cagayan	4	2											1							2							1						2	12
Capiz	6	2			1								1							3							1						1	15
Cavite	2	2			1															5				1		1		2					1	15
Cebu	8	2							1											6	1			1	1	4		9					22	55
Cotabato	5	2		1	1															1				1			1	1			1		5	19
Davao	6	3			1								1							3				1	2	1	2	1			2		14	37
Ilocos Norte	2	3							1											5		1	2		1								3	18
Ilocos Sur	6	3											1							4						1	1				1		4	21
Iloilo	14	5			4															1				1	1	3					1		5	35
Isabela	4	2									1		2							8													4	21
La Laguna	3	3			1								2							8				2		1		4					1	25
Lanao	4	3		1		1														5				1		1					2		5	23
La Union	5	3									1									6				1									1	17
Leyte	5	2							1		1		4			1			1	5		1		3									3	27
Manila																										3							1	4
Mindoro	2	3								1			1							1	1				1	1		2			1		3	16
Misamis	11	3		1	6															1				1				1					3	27
Mt. Province	8	12			2						2		5							2				1		2		3			1	1	11	50
Nueva Ecija	8	2			1								1							2													2	16
Nueva Vizcaya	5	4																		4		2						1			1		3	20
Occ. Negros	10	2			1																						1						1	15
Or. Negros	5	4			1		1													3								2					3	19
Palawan	6	1																						1		4		3				5		20
Pampanga	5	4											1							8						1		1					2	22
Pangasinan	9	3			3				1				2							10			1	2		2							2	35
Rizal	5	4							2		1									1													2	15
Romblon	1	1									2									2										2			1	9
Samar	5	2	1																	2				1									2	13
Sorsogon	6	2						1					1				1			2		1		1				1					1	17
Sulu	1	2																		3						7		1			2		4	20
Surigao	2	2									1									4						3		4					1	17
Tarlac	4	3											3							2						1							1	14
Tayabas	5	4								1										3				1	4	1		5					14	38
Zambales	4	2																		2		1				1		1			1		2	14
Zamboanga	5	4	1							1										4				1	2	1						1	5	25
Total	234	137	3	4	25	2	2	2	7	6	11		29		2	2	2		3	150	4	6	7	31	21	51	8	58		2	17	10	164	1,000

NOTE.—Of the 164 projects under the caption "Miscellaneous," there are 17 surveys and investigations of roads, bridges, water supply, irrigation systems, hydrographic, etc., 1 dock, 14 artesian wells, 10 port works maintenance, 1 harbor maintenance project, 11 irrigation systems, 9 wharves, 4 river control projects, 1 custom house, 1 dredging project, 1 dyke, 9 constabulary buildings, 6 irrigation ditches, 2 water tanks, 12 hospitals, 3 piers, 1 dam, 1 monument and 60 other less important projects.

APPENDIX D.

PROJECTS ACTIVE OCTOBER 1, 1920

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile line.	Quarries.	Telephone lines.	Electric light plants.	Miscellaneous.	
Abra	6	3			1															2								1			2		2	17
Agusan	5	4																		3				1	1	1					1		6	22
Albay	4	5			1								1													1							2	14
Antique	4	2																		3								1						10
Bataan	2	4					1				1									2						2							2	14
Batangas	5	6			1					1					1				1	6	11			3	2			5				2	17	61
Benguet	4	8											1	1	1					2					2	10		1	1			1	9	41
Bohol	6	3		1	1	1											1			7				2	1	1		2					7	33
Bukidnon	3	2																		1						1		1			1			9
Bulacan	6	5			2															6						2		1					4	26
Cagayan	3	2			1															3				1		1	1						4	16
Camarines Norte	1	1				1							1							2				1										7
Camarines Sur	3	3				1				1			2						1	3	1			2	1	3	1						2	24
Capiz	6	2		1	1								1							4							1						1	17
Cavite	3	2			2															5				2		1		3						18
Cebu	7	2		1					1											5			2	1	3	5		12					32	71
Cotabato	5	2		1	1															1				1		2	1				2		6	22
Davao	6	3											1							2				1	1	2	1	1			2		13	33
Ilocos Norte	2	3		1					1											5			2										2	16
Ilocos Sur	5	2														1		1		4						1	1				1		3	19
Iloilo	14	4	3						1											1				1	1	3							5	37
Isabela	4	2									1		2							7	1												3	20
La Laguna	3	2		1	1			1					2							9				1		1		3					1	25
Lanao	6	3		1		1							1							5				1		1					2	1	4	26
La Union	5	3									1									5				1									1	16
Leyte	7	2							1	1			5						1	2	1			3									3	26
Manila					1															1						19							64	85
Marinduque	2	2																		1				1				2					6	14
Mindoro	2	3								1										1	2				1	2		1			1		4	18
Misamis	12	3			6															1				1									4	27
Mountain Province	8	12			2						2		2							2		1		1		1		3			1	1	9	45
Nueva Ecija	8	2		1	1	1							1							4				1			1	1					2	23
Nueva Vizcaya	6	4																		4		2					1				1		3	21
Occidental Negros	11	2			2															1				1			1						1	19
Oriental Negros	5	5		1	1					1										3								2					4	22
Palawan	7	1								2														1		2		3			5		1	22
Pampanga	5	3																		8								1					4	21
Pangasinan	9	3		1	3				1				2							8			4	3	1								3	38
Rizal	7	4			1					1																							2	15
Romblon	2	1																		3										2			1	9
Samar	5	3																		4				1									4	17
Sorsogon	5	2						1					1				1			1		1		1		1							1	15
Sulu	1	2																		4						8		1			2	1	5	24
Surigao	2	2									1									6						2		4					2	19
Tarlac	4	3											2			1				2						1							2	15
Tayabas	2	2								2					1					3					4	3		3					14	34
Zambales	4	2																		2	2	1						1			1		2	15
Zamboanga	3	5								1										2	1			1	2	2						1	6	24
Total	235	146	3	10	33	5	1	2	5	11	6		25	1	3	2	2	1	3	156	19	5	8	34	20	71	9	53	1	2	22	7	273	1,182

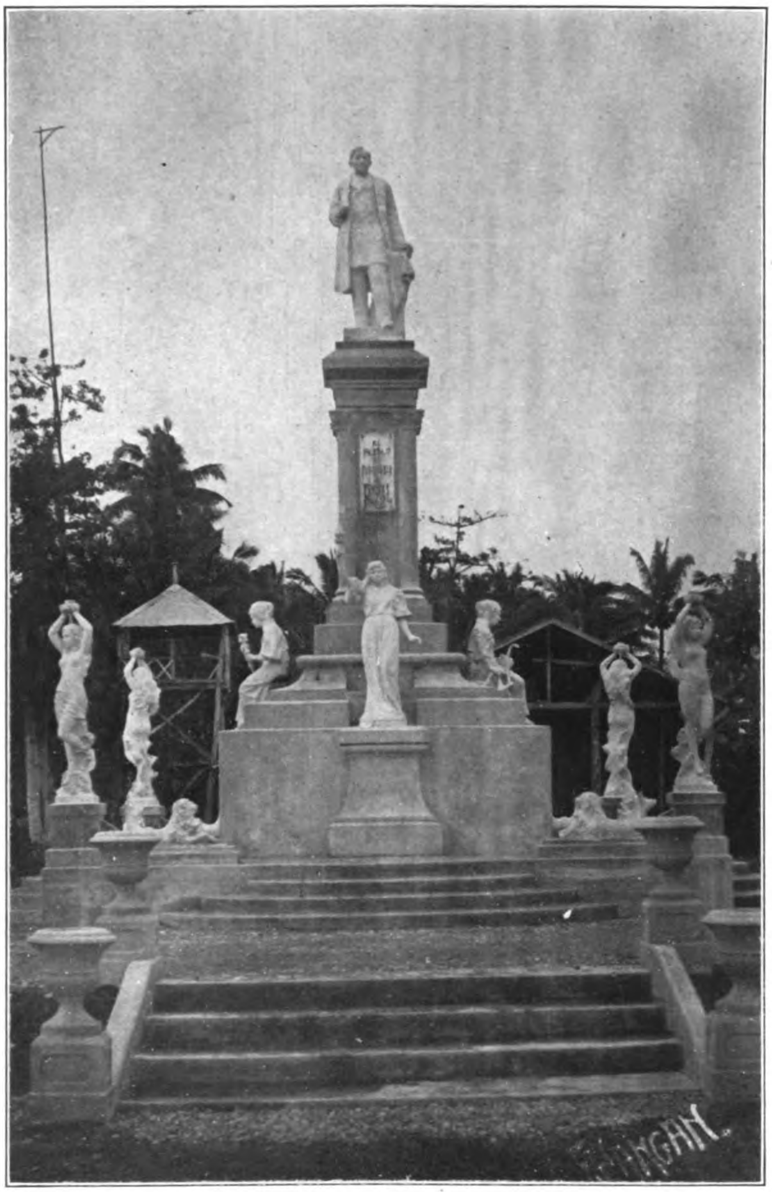
NOTE.—Of the 273 projects under the caption "Miscellaneous," there are 22 surveys and investigations of roads, water supply, irrigation systems, hydrographic, school sites, etc., 13 artesian wells, 12 port works maintenance, 7 harbor maintenance projects, 13 irrigation systems, 11 wharves, 5 river control projects, 1 custom house, 3 dredging projects, 2 dyke projects, 9 constabulary buildings, 5 irrigation ditches, 3 water tanks, 11 hospitals, 3 piers, 1 dam, 1 monument an other less important projects.

APPENDIX E.

PROJECTS ACTIVE JANUARY 1, 1921

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plants.	Miscellaneous.	
Abra	6	3						1												2								1			2		2	17
Agusan	2	3																		2						1					1		1	10
Albay	3	5		1	1								2																				3	15
Antique	4	2																		1								1						8
Bataan	2	4					1				1									2						2							3	15
Batangas	7	5			1					1						1	1		1	8	3			3	2	2		7				2	37	81
Benguet	5	8											1							1					2			2	1			2	18	40
Bohol	6	3							1				1	1			1			6				2	1			3					7	32
Bukidnon	3	2																		1						1		1			1			9
Bulacan	4	6		1	3															7								1					6	28
Cagayan	2	3																		2							1						4	12
Camarines Norte	1	1				1							2							3				1										9
Camarines Sur	3	3				1				1			1						1	4	1			2	1		1						5	24
Capiz	6	2		1	2								1							4							1						1	18
Cavite	3	2			2															5				2				3					1	18
Cebu	8	2																		6		1			2	1		9					38	67
Cotabato	5	2		1	1															2				2		1	1				2		9	26
Davao	5	3											1							3					1	1	1	1			2		13	31
Ilocos Norte	3	3							1				1							6													5	19
Ilocos Sur	5	2											1							3				1			1						4	17
Iloilo	15	3	4		1								1							3				2	1								9	39
Isabela	4	2		1							1		2							8	1												4	23
La Laguna	3	2		1	1			1					1							7				1				2					2	21
Lanao	6	3		1		1							1							5				1							2		8	28
La Union	5	4									1									7				1									1	19
Leyte	5	1			1				1	1			5						1	3	1			2									2	23
Manila					1															2						21					1	1	61	87
Marinduque	3	2																		1				1				2					7	16
Mindoro	2	3								1										1	1							1			1		7	17
Misamis	12	3			6															2				1				1					4	29
Mountain Province	7	12			2						2		2							2		1		1				3			1	1	13	47
Nueva Ecija	8	2		1	2	1							1							5				1			1	1					2	25
Nueva Vizcaya	6	4																		4		3					1				1		3	22
Occidental Negros	11	2			2															1				1			1						1	19
Oriental Negros	5	5		1						1										3								2					4	21
Palawan	7	2																						1				3			5		10	28
Pampanga	5	2											1							9								1					4	22
Pangasinan	5	2			3				1				2							10		3		2									4	32
Rizal	5	3			1					1										5													4	19
Romblon	1	1																		4										2			1	9
Samar	5	3																		6				1				1					6	22
Sorsogon	5	3						1					1				1			1		1		1									1	15
Sulu	2	2																		3	1					1		1			2		16	28
Surigao	2	2								1										7								4					3	19
Tarlac	4	3			1								2							2													3	15
Tayabas	3	2								1			2		1					6					1	1		5					5	27
Zambales	4	2																		2	2	2				1		1			1		3	18
Zamboanga	4	5								1										3					1							1	9	24
Total	227	144	4	9	31	4	1	3	4	9	5		32	1	1	1	3		3	180	10	11		30	12	33	9	57	1	2	22	7	354	1,210

NOTE.—Of the 354 projects under the caption "Miscellaneous," there are 22 surveys and investigations of roads, water supply, irrigation systems, hydrographic, etc., 4 artesian wells, 18 port works maintenance, 4 harbor maintenance projects, 14 irrigation systems, 14 wharves, 3 river control projects, 2 custom houses, 3 dredging projects, 1 dyke, 9 constabulary buildings, 6 irrigation ditches, 1 water tank, 15 hospitals, 2 piers, 1 dam, 1 monument and 233 other less important projects.



Rizal Monument erected in the municipality of Cabadbaran, Province of Agusan, December, 1920 (Sculptor, Zamora).

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1921.]

JOSE PAEZ, ***Director of Public Works***
MARCIAL KASILAG, ***Acting Chief Constructing Engineer***
E. C. EARLE, ***Chief Designing Engineer***
A. D. WILLIAMS, ***Chief Irrigation Engineer***
TOMAS MAPUA, ***Supervising Architect***
JUAN ARELLANO, ***Supervising Architect***

CENTRAL OFFICE ORGANIZATION.

ADMINISTRATIVE DIVISION.

Francisco Cruz, Chief Clerk.
Rosendo Reinoso, Chief Accountant.
T. Camú, Cashier and Disbursing Officer.
Primo Villar, Law and Record Clerk.
Jose de Jesus, Property Clerk.
B. Manipula, Superintendent of Automobiles.

DESIGNING DIVISION.

W. J. Grodske, Project Engineer.
L. L. Vincent, E. and M. E.
L. H. Thompson, E. and M. E.
R. S. Clemons, E. and M. E.
J. J. Deering, E. and M. E.
T. A. Mills, C. E.
H. H. Houk, Designing Engineer.
Julian Vallarta, C. E.
W. Barry, Pile Driver Supt.
Juan Piedad, C. E.
Teofilo Reyes, C. E.
J. A. V. Corpus, M. E.
D. Guanio, C. E.
V. Vilanueva, Assistant Electrical Engineer.
E. Segui, Assistant C. E.
H. Reyes, Assistant Electrical Engineer.

DIVISION OF ARCHITECTURE

Cheri Mandelbaum, Chief Architectural Draftsman.
E. R. Hyde, Structural Engineer.
Teodato Macabulos, C. E.
Gonzalo Vales, C. E.
M. Roco, Assistant C. E.
Ambrosio Diaz, J. C. E.
V. Fernandez Lavadia, J. C. E.
C. Barreto, Supervising Architectural Draftsman.
A. Toledo, Supervising Architectural Draftsman.
A. Tayzon, Estimator.
E. V. Felix, Architectural Draftsman.

CONSTRUCTING DIVISION.

N. S. Saleeby, Highway Engineer.
Juan Macaraeg, Senior Supervising Engineer.
A. T. Sylvester, Constructing Engineer.
H. C. Garretson, C. E.
J. Ignacio, Assistant C. E.
H. Franco, Chief Electrician.
Fred. McCaw, Acting Superintendent of Artesian Wells.
V. Castillo, Superintendent of Dredges.
J. T. Bootes, Superintendent of Dredge Construction.
Q. Camus, Traveling Inspector.
I. Fernando, C. E. on special duty, Nueva Ecija.
R. Custodio, Superintendent of Construction, Batanes.

IRRIGATION DIVISION.

G. G. Stroebe, Hydraulic Engineer.
V. L. Legarda, C. E.
H. P. Hart, Designing Engineer.
E. Quisumbing, Designing Engineer.
W. J. Lamon, Supervising Irrig. Eng'r.
E. L. Driggs, Project Engineer.
B. B. Buchanan, C. E.
V. A. Tan, C. E.
Leon Ines, C. E.
Gonzalo Garcia, C. E.
Ricardo Nostratis, C. E.
Jacinto Gochoco, C. E., Acting Chief Hydrographer.
Manuel Gonzalez, Assistant C. E.
G. de Leon, Assistant C. E.
G. Cruel, Assistant C. E.
V. Alcañeses, J. C. E.
J. Centeno, J. C. E.
A. Martinez, J. C. E.
Nicanor Cortes, Assistant C. E.
W. Demers, Supervising Hydrographer.
A. Baldonado, District Hydrographer.
A. Abaya, Chief Water Sights Inspector.
M. Leones, Supervising Surveyor.

DISTRICT ORGANIZATION.

E. J. Halsema, D. E. and S. E., Benguet.
L. W. Scheide Mantel, Assistant Engineer, Benguet.
R. Garcia, Acting D. E., La Union.
M. Diaz, Acting D. E., Mountain Prov.
Dalmacio Urtula, D. E. and S. E., Albay.
S. Bayan, Acting D. E., Camarines Norte.
S. Tan Chauco, Acting D. E., Camarines Sur.
J. F. Imperial, Acting D. E., Sorsogon.
Luis Francisco, D. E. and S. E., Tayabas.
M. Arranz, Acting D. E., Rizal.
G. J. Militante, Acting D. E., Cavite.
J. V. Bagtas, D. E., La Laguna.
R. Borromeo, J. C. E., La Laguna.
F. V. Larracas, D. E., Batangas.
M. C. Navarro, Assistant C. E., Batangas.
M. M. Resplandor, Acting D. E., Mindoro.
R. Villalon, Acting D. E., Marinduque.
P. Avisado, D. E., Palawan.
J. C. Cookingham, D. E. and S. E., Zamboanga.
C. R. Hopper, C. E., Zamboanga.
G. Alcantara, Acting D. E., Lanao.
W. J. Hollis, Acting D. E., Sulu.
J. Lozada, Acting D. E., Davao.
J. Follosco, Acting D. E., Cotabato.
B. Villanueva, Acting D. E., Misamis.
M. Operario, J. C. E., Misamis.
M. Angeles, Acting D. E., Bukidnon.
A. V. Martinez, Acting D. E., Agusan.
Alejo Aquino, Acting D. E. and S. E., Iloilo.
F. P. Reynolds, Assistant Engineer, Iloilo.
R. O. Ylagan, J. C. E., Iloilo.
A. P. Nitorreda, D. E., Capiz.
H. S. Clemente, Acting D. E., Antique.
J. Arquisola, Acting D. E., Romblon.
Mamerto Cruz, D. E. and S. E., Cagayan.
L. Urtizberea, Acting D. E., Isabela.
V. Oledan, Acting D. E., Nueva Vizcaya.
E. D. Smith, D. E. and S. E., Ilocos Sur.
A. C. Babcock, Assistant Engineer, Ilocos Sur.
S. Fernandez, D. E., Ilocos Norte.
L. Espejo, Assistant C. E., Ilocos Norte.
Saturnino Lopez, D. E. and S. E., Pangasinan.
Jose Wright, Assistant C. E., Pangasinan.
V. Orosa, D. E., Nueva Ecija.
J. Laguardia, Acting D. E., Tarlac.
M. Reyes, D. E., Pampanga.
I. Lagniton, D. E., Bulacan.
M. A. de Castro, Acting D. E., Zambales.
G. Gaza, Acting D. E., Bataan.
L. T. Clark, D. E. and S. E., Cebu.
V. Segura, C. E., Cebu.
A. Osmeña, Assistant C. E., Cebu.
J. Gandiongco, Acting D. E., Oriental Negros.
V. Fragante, D. E., Occidental Negros.
M. Dimson, Acting D. E., Bohol.
H. R. Meehlieb, Acting D. E., Leyte.
T. J. Medicielo, C. E., Leyte.
T. Mocorro, J. C. E., Leyte.
M. F. Chiyuto, J. C. E., Leyte.
R. S. Frush, D. E., Samar.
F. [illegible], J. C. E., Samar.
L. Ortiz, Acting D. E., Surigao.

LEGEND.

S. E. = Supervising Engineer.
C. E. = Civil Engineer.
E. & M. E. = Electrical and Mechanical Engineer.
J. C. E. = Junior Civil Engineer.

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THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS

BULLETIN

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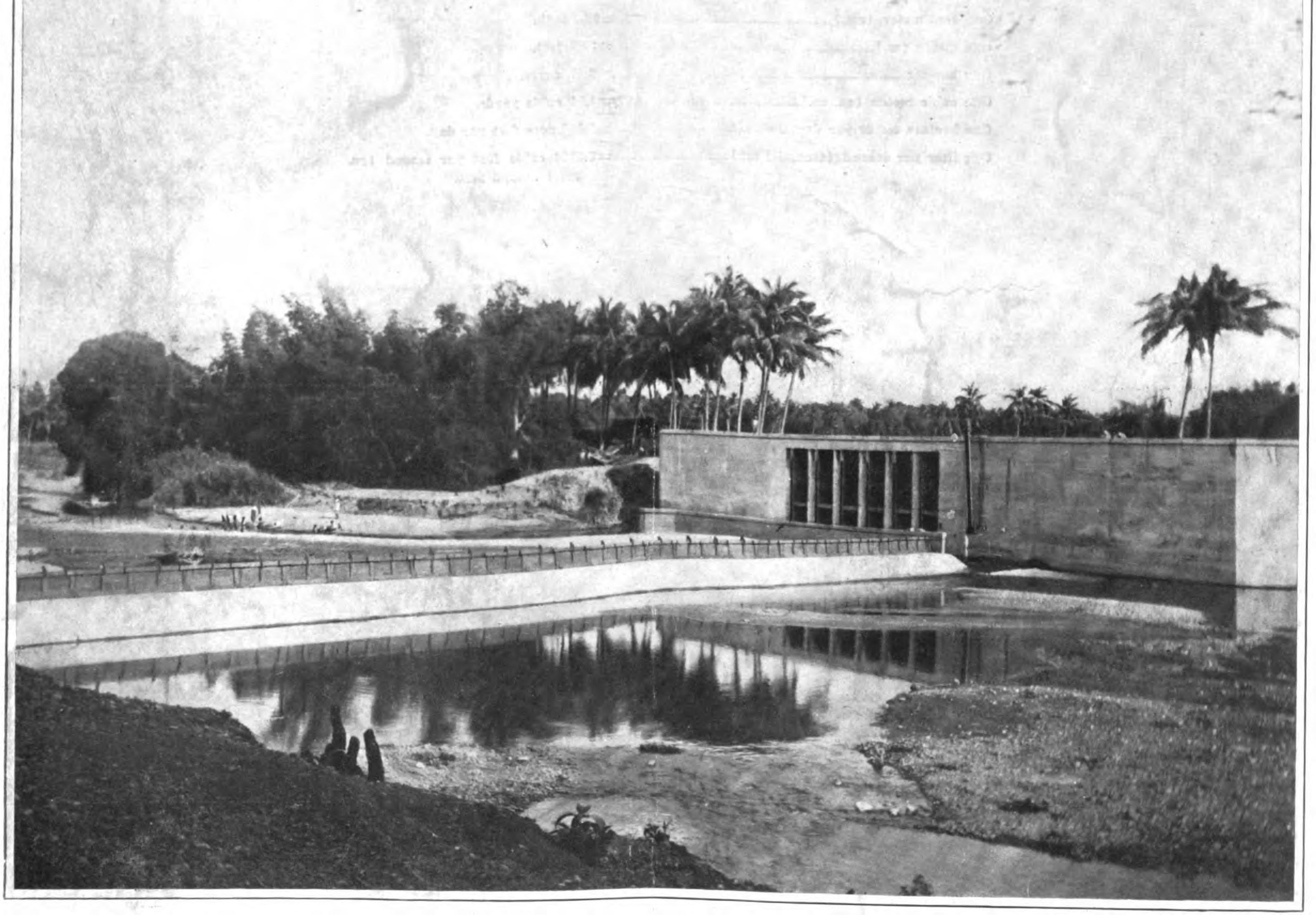


DIVERSION WORKS, SANTA BARBARA IRRIGATION SYSTEM, ILOILO, P. I.

191736

CONVERSION TABLE

One peso (₱) = 50 cents, U. S. currency.
One kilometer (km.) = 0.62 mile.
One kilogram (kg.) = 2.20 pounds (lbs.)
One centimeter (cm.) = 0.39 inch.
One meter (m.) = 3.28 feet.
One hectare = 2.47 acres.
One cubic meter (cu. m.) = 1.31 cubic yards.
One hectare meter per day = 8.107 acre feet per day.
One liter per second (second liter) = 0.0353 cubic foot per second (cu. sec.) second feet.

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1921

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, P. I., March 15, 1922.

Sir: I have the honor to submit herewith the Report of the Bureau of Public Works for the Fiscal Year ending December 31, 1921.

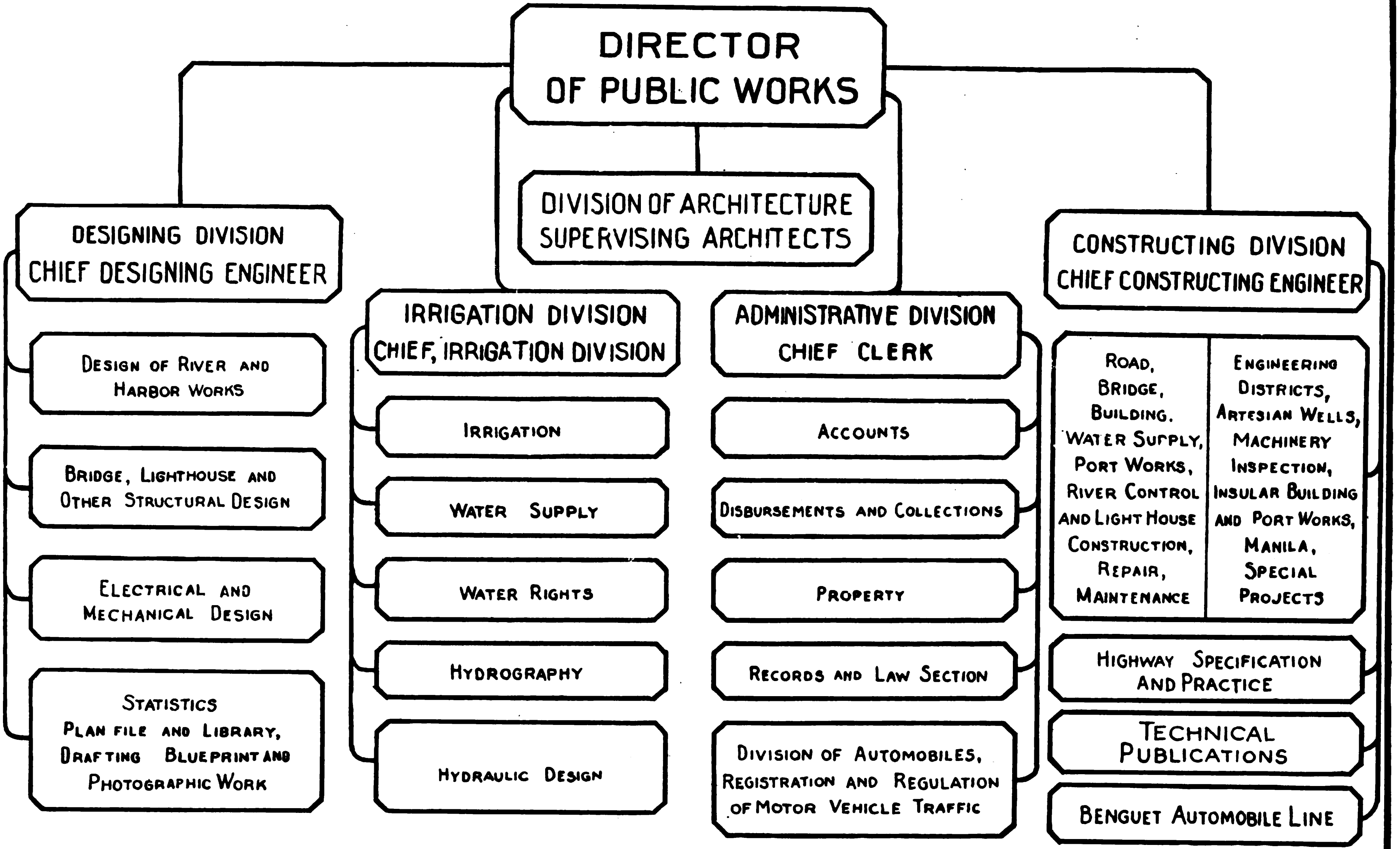
Very respectfully,

JOSE PAEZ,
Director of Public Works.

The Honorable,
THE SECRETARY OF COMMERCE AND COMMUNICATIONS,
MANILA, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1921


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
Design of River and Harbor Works
Bridge, Lighthouse and Other Structural Design
Electrical and Mechanical Design
Statistics Plan file and Library, Drafting Blueprint and Photographic Work
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
Irrigation
Water Supply
Water Rights
Hydrography
Hydraulic Design
ADMINISTRATIVE DIVISION CHIEF CLERK
Accounts
Disbursements and Collections
Property
Records and Law Section
Division of Automobiles, Registration and Regulation of Motor Vehicle Traffic
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
Road, Bridge, Building. Water Supply, Port Works, River Control and Light House Construction, Repair, Maintenance
Engineering Districts, Artesian Wells, Machinery Inspection, Insular Building and Port Works, Manila, Special Projects
Highway Specification and Practice
Technical Publications
Benguet Automobile Line

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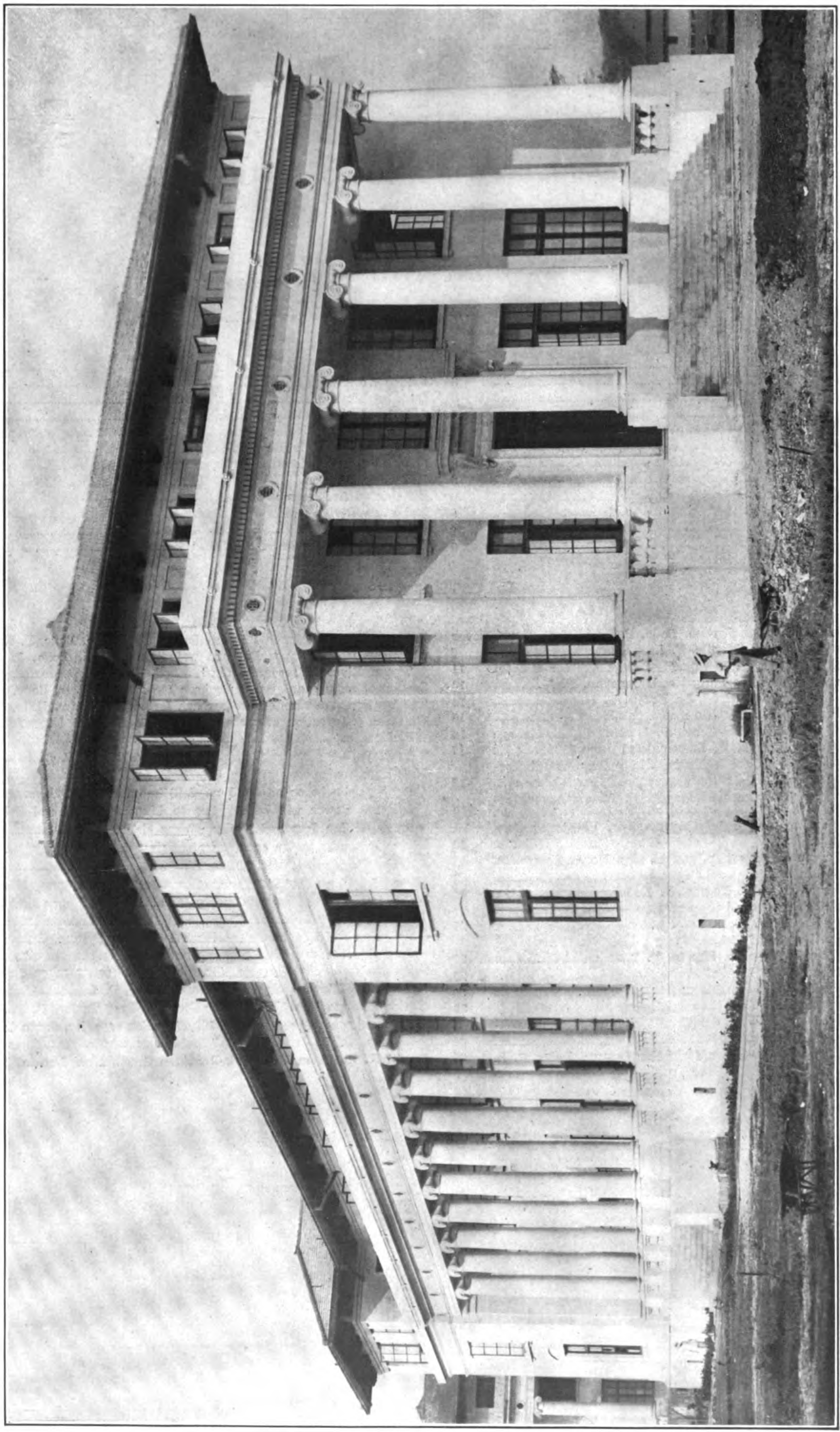


Rizal Hall, University of the Philippines, Manila, P. I.

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

During the year 1921 the organization of the Bureau of Public Works remained practically the same as in the preceding year. However, toward the end of the fiscal year, plans were laid for the re-organization of the Constructing Division field personnel, designed to secure more efficient supervision over all construction projects, and at the same time greater economy in the cost thereof. The outstanding feature of this re-organization plan is the creation of six positions for Division Engineers whose principal and exclusive duties would be the supervision of all the work carried on in the various engineering districts of the archipelago. These duties have heretofore been discharged by supervising engineers who, at the same time, were in charge of engineering districts as district engineers. It is expected that this re-organization of the Bureau's field personnel will be made early in 1922.

Plans for the re-organization of the Division of Architecture were also considered and proper steps will be taken as soon as possible during the coming year for their realization. It has been the experience of this Bureau in the past that the present organization of the Division of Architecture with two Supervising Architects at its head, with divided responsibilities, is not entirely conducive to the most efficient results. The appointment of a Consulting or Chief Architect to take charge of this Division will undoubtedly prove far more satisfactory.

This Bureau reiterates its previous recommendations made to the effect that better and more commensurate remuneration be offered to all the technical men in its service, particularly to the heads of the various technical divisions in order that the services of experienced engineers may be retained and in this way maintain the efficiency of the Bureau. There is no doubt but that the services of the older engineers are worth a great deal more to the Government than those of new engineers who are not acquainted with the local conditions of the work.

PERSONNEL

Number of employees paid direct from Bureau funds as of December 31, 1921: Americans, 35; Filipinos, 347.

(NOTE.—The corresponding figures for December 31, 1920, are 33 and 365, respectively.)

Number of technical employees, December 31, 1921: Americans, 27; Filipinos, 99.

(NOTE.—The corresponding figures for December 31, 1920, are 26 and 117—(this latter figure should be 82, if draftsmen and other semi-technical employees were to be excluded, respectively.)

American technical employees

	Classified.	Unclassified.	Total.
Civil engineers	18	1	19
Assistant engineer	1	0	1
Electrical and mechanical engineers	2	2	4
Structural engineer	1	0	1
Surveyor	1	0	1
Architect	1	0	1
Total	24	3	27

Filipino technical employees

	Classified.	Unclassified.	Total.
Civil engineers	29	5	34
Assistant civil engineers	21	14	35
Junior civil engineers	4	9	13
Surveyors	5	4	9
Junior surveyor	1	0	1
Assistant electrical engineer	1	0	1
Junior electrical engineer	1	0	1
Supervising architects	2	0	2
Architects	2	0	2
Mechanical engineer	1	0	1
Total	67	32	99

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau, by whatever branch of the Government paid:

	American.	Filipino.	Other foreigner.	Total 1921.	Total 1920.
Number of appointments	10	729	20	759	853
Number of transfers to Bureau	0	8	0	8	35
Number of separations for cause	0	58	0	58	21
Number of voluntary resignations	4	176	1	181	216
Number of transfers from Bureau	0	11	0	11	24
Number of separations due to retirement	3	2	0	5	2
Number of separations due to expiration of employment	2	23	0	25	4
Number of deaths	0	7	0	7	5

NOTE.—Item "Number of appointments" includes new and probational appointments.

In spite of the reversion of various public works funds by the Emergency Board toward the middle of the year and the subsequent paralyzation of work on many important projects, very satisfactory results were obtained, as may be noted from the following report and tabulations.

The public works expenditures incurred under the supervision of the Bureau of Public Works during the year amounted ₱22,438,604.74, this being the largest amount ever expended on Philippine public works in any one year. Because of the large number of projects undertaken, the Bureau of Public Works was operated for the first time since its organization at a profit of ₱121,615.33, which amount represents the difference between the operating revenues and the operating expenses of the Bureau.

While new road and bridge construction has been greatly curtailed due to lack of funds, road and bridge maintenance work has been more extensively and effectively carried out to meet the requirements of the ever increasing volume of traffic. During the year 8,107.1 kilometers of first- and second-class roads were maintained at a total cost of ₱4,508,321.23. This is the largest kilometerage of road ever maintained, and exceeds that of 1920 by 575.7 kilometers.

During the first half of the year, the construction or completion of many modern public buildings of large dimensions was also vigorously prosecuted until the funds provided therefor were either reduced or reverted by the Emergency Board, with the result that work on many projects had to be suspended. In spite of this, 148 permanent buildings comprising schools, presidencias, markets, hospitals, etc., were completed during the year. This figure represents an increase of over 80 per cent of the number of public buildings completed during the preceding year and is the largest number completed in any single year since 1915.

Satisfactory progress was made on the construction of Pier No. 7 during the first half of the year; but due to lack of funds, work was delayed thereafter and unless funds from the Port Works Bond Issue can be released at an early date, it may become necessary to suspend construction activities.

The Trinidad Irrigation System was completed during the early part of the year and work on 13 irrigation systems, which will benefit 55,774 hectares of land and which will cost approximately ₱8,584,500, was well underway. The retrenchment policy adopted by the Government affected only those projects which were being undertaken by administration, but not those that were being accomplished by contract, of which there were six. The total amount expended upon these projects during the year amounted to ₱1,461,409.41.

During the year, 13 new waterworks systems were completed at a total cost of ₱721,342.50, to serve a total population of 41,000. Seven new waterworks projects were started, and twenty-seven systems on which work was commenced in the preceding two years were practically completed. There were also 125 successful deep wells drilled during the year, which will serve approximately 316,000 people, at a cost of ₱338,770.54.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS

Items.	Insular expenditures.				Provincial and municipal expenditures.		Fund from private source.		Total.	
	Bureau of Public Works.		Appropriation controlled by other Bureaus.							
	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921
Roads and bridges	₱98,897.38	₱586,527.34	₱630,642.24	₱82,750.82	₱6,724,459.80	₱6,347,725.07	₱2,499.38	....	₱7,456,498.77	₱7,017,003.23
Buildings	1,673,623.93	2,370,627.53	936,817.16	386,900.15	2,637,978.40	3,532,026.10	79,466.83	₱19,771.64	5,332,836.32	6,309,325.42
Maintenance, alteration and repair of public buildings	395,234.79	519,036.51	80,067.97	(54,447.27)	....	341.32	116,853.37	377.76	592,156.13	465,308.32
River and harbor work including purchase and reconstruction of equipment, light buoys and beacons	1,395,282.33	2,098,614.75	1,344,179.41	2,784,652.00	29,538.64	17,645.62	....	1,045.32	2,769,000.38	4,901,957.69
Artesian wells and water supply	697,169.57	313,525.46	83,619.00	47,183.41	1,027,718.29	715,983.50	45,072.51	33,673.08	1,853,579.37	1,110,365.45
Irrigation project	385,046.19	1,627,623.73	....	3,577.68	....	30,556.11	1,774.78	1,047.00	386,820.97	1,662,804.52
Benguet auto line	150,000.00	140,000.00	....	....	....	....	....	....	150,000.00	140,000.00
Los Baños quarries	150,000.00	150,000.00	....	....	....	....	....	....	150,000.00	150,000.00
Registration and regulation of motor vehicle traffic	75,000.00	64,000.00	....	....	....	....	....	....	75,000.00	64,000.00
Miscellaneous	7,579.29	1,046.68	193,384.23	214,561.72	519,828.12	393,653.33	42,881.70	8,578.39	763,673.34	617,840.11
Total	5,032,833.48	7,871,002.00	3,268,710.01	3,465,178.51	10,939,523.25	11,037,931.05	288,548.54	64,493.18	19,529,615.28	22,438,604.74

BALANCE SHEET, BUREAU OF PUBLIC WORKS

			1920	1921		1920	1921
CURRENT ASSETS					CURRENT LIABILITIES		
Cash (collecting and disbursing officers)			₱1,182,283.92	₱1,422,961.04	Treasury account	₱3,466,184.12	₱4,264,576.39
Supplies and materials			787,807.95	1,045,838.86	Accounts payable	519,588.70	364,948.58
Work in process			3,008.29	....	Undistributed collections	2,390.74	4,703.12
Accounts receivable			2,598,093.04	2,429,327.33	Accrued leave payable	217,850.51	175,088.47
Investment and securities			400.00	....	Insurance reserve	350,233.09	61,390.78
Prepayments			18,263.14	10,718.29	Deferred credits to income	33,609.19	38,135.18
FIXED ASSETS					SURPLUS		
Real property and improvements [a]			28,323,814.70	33,017,057.94	Principal accounts surplus (fixed assets)	29,716,075.47	35,110,316.24
Equipment	2,550,305.33	....	3,208,318.51	....			
Less depreciation	(1,158,044.56)	1,392,260.77	(1,115,050.21)	2,093,258.30			
Total	....	34,305,851.82	....	40,019,158.76	Total	34,305,851.82	40,019,158.76

[a] All previously completed Insular improvements taken under fixed assets.

STATEMENT OF APPROPRIATION—INCOME AND EXPENSES

Debit.	1920	1921	Credit.	1920	1921
Reversion of unexpended balance of administrative appropriation	₱181,762.11	₱129,150.25	Appropriation of administrative expense of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱1,384,664.00	₱1,346,833.57
Reversion of receipts	1,039,303.47	1,332,498.63	Receipts—prime cost	7,994,847.29	10,704,898.12
Operating expenditures offset by receipts	7,994,847.29	10,704,898.12	Receipts—surcharges	923,899.18	1,192,957.74
Expenditures administrative appropriation	1,173,714.11	1,210,883.32	Receipts—miscellaneous	50,636.11	56,169.42
Outlays, purchase of equipment	29,187.78	6,800.00	Gain on supplies sold	4,446.09	3,582.18
			Inventory—adjustments	705.07	3,332.08
			Income from rentals	23,564.37	20,567.77
			Interest on investment and securities	160.00	120.00
			Sales of fixed assets	3,641.20	1,440.67
			Prior year's credit	32,251.45	54,328.79
Total	10,418,814.76	13,384,230.34	Total	10,418,814.76	13,384,230.34

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) DURING 1921

Principal account surplus December 31, 1920	₱29,716,075.47	Equipment sold		₱1,391.79
Purchase of equipment (general funds)	6,800.00	Equipment condemned and dropped		72,884.84
Purchase of equipment from (specific funds)	5,414,309.20	Equipment dropped by transfer to province and municipalities		....
Fixed property brought into account equipment acquired by transfer	....	Equipment dropped by transfer to other Bureaus (J. V. 31503 and 31661)		254.57
Equipment found at station including worn-out tires taken into account	205.00	Equipment issued to job		335.46
Equipment acquired by construction	507.37	Depreciation written off:		
		1. Depreciation on written off on account of equipment dropped on affidavits, undersold, etc.	(₱72,884.84)	
		2. Depreciation written off on Bureau equipment (actual)	3,434.67	
		3. Depreciation written off on Benguet Automobile Line equipment	26,465.82	(42,984.35)
		Principal account surplus December 31, 1921		35,110,316.24
Total debits	35,142,198.55	Total credits		35,142,198.55

OPERATION STATEMENT, BUREAU OF PUBLIC WORKS

Operating revenue.	Debit.		Operating expenses.	Credit.	
	1920	1921		1920	1921
Rental	23,564.37	20,567.77	Supervising, technical and clerical service—salaries	832,449.02	893,560.85
Surcharges	923,899.18	1,192,957.74	Bonuses	119,676.32	79,684.27
Gain on goods sold	4,446.09	3,582.18	Labor	57,173.99	67,818.20
Interest on investment and securities	160.00	120.00	Consumption of materials	65,977.26	69,122.49
Inventory adjustments	705.07	3,332.08	Rental of buildings	16,096.45	24,120.00
Other service income	86,528.76	111,938.88	Illumination and power service	13,099.36	10,164.19
			Traveling expenses of personnel	26,082.45	22,446.67
			Repair service	17,163.28	16,345.11
			Postal, telegraph, telephone and cable service	9,295.17	11,667.50
			Other expense	16,700.81	15,954.04
			Operating profit	[a](134,410.64)	121,615.33
Total	1,039,303.47	1,332,498.65	Total	1,039,303.47	1,332,498.65

[a] Operating loss considered as aids to local governments.

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first class	kilometers	137.6
Reinforced concrete bridges and culverts completed	number	16
(In this figure, concrete pipe culverts are not included)		
Successful deep wells completed	number	125
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	number	94

Expenditures supervised during the year 1921 as compared with the year 1920

	1921	1920
Total expenditures	₱22,438,604.74	₱19,529,615.28
Total expended upon road and bridge work	7,017,003.23	7,456,498.77
Total expended upon building work	6,774,633.74	5,925,042.45
Total expended upon port works	4,901,957.69	2,769,000.38
Total expended upon water supply	1,110,365.45	1,858,579.37
Total expended upon irrigation projects	1,662,804.52	386,820.97
Operation of auto line, quarries and the supervision of motor vehicle traffic	354,000.00	375,000.00
Expenditures on miscellaneous items account for the balance	....	....

ROAD WORK

Length of roads in existence

	December 31, 1920.	December 31, 1921.
	Kilometers.	*Kilometers.*
First-class	4,698.8	4,863.4
Second-class	2,037.5	2,044.8
Third-class	3,079.8	3,036.6
Total	9,816.1	9,917.8

Relation of first-class road construction and maintenance

Fiscal year ending December 31—	Designated first-class roads at end of year.	First-class roads constructed during year.	Average maintained throughout the year by the caminero system.
1916	3,436.2	368.5	3,226.8
1917	3,738.7	299.1	3,616.1
1918	4,090.2	351.5	4,023.4
1919	4,500.3	410.1	4,444.2
1920	4,698.8	198.5	4,601.3
1921	4,836.4	137.6	4,906.8

The term "designated first-class roads" means surfaced road maintained by the caminero (cantonnier) system under specific agreement between the Insular Government and each separate province.

Roads in existence in the various provinces of the Philippines as of December 31, 1921

Province.	First-class roads.	Second-class roads.	Third-class roads.	Total roads.	Trails.
	Kilometers.	*Kilometers.*	*Kilometers.*	*Kilometers.*	*Kilometers.*
Abra	49.0	20.8	8.1	77.9	38.3
Agusan	17.8	6.5	18.2	42.0	33.8
Albay	179.5	48.8	54.9	283.2	83.5
Antique	104.4	89.7	30.0	224.1	18.4
Baguio	41.2	.7	2.2	44.1	2.2
Bataan	34.6	20.6	2.3	57.5	75.7
Batangas	184.2	21.7	156.7	362.6	38.7
Benguet	75.3	5.2	4.8	85.3	....
Bohol	185.3	88.6	42.6	316.5	8.6
Bukidnon	....	97.0	16.7	113.7	94.4
Bulacan	103.9	118.5	87.5	309.9	....
Cagayan	54.5	105.8	18.9	179.2	138.8
Camarines Norte	24.0	5.2	17.7	46.9	....
Camarines Sur	138.0	31.4	59.3	228.7	28.4
Capiz	179.8	109.8	13.0	302.6	138.0
Cavite	82.2	21.5	17.7	121.4	98.8
Cebu	295.5	237.4	106.7	639.6	54.5
Cotabato	12.8	2.4	57.1	72.3	245.5
Davao	5.8	4.0	53.7	63.5	599.8
Ilocos Norte	78.4	102.6	1.3	182.3	....
Ilocos Sur	165.6	31.1	59.6	256.3	94.3
Iloilo	266.0	36.6	167.0	469.6	11.6
Isabela	79.9	29.3	116.0	225.2	....
Laguna	147.9	19.8	64.3	232.0	29.4
Lanao	30.4	30.2	21.7	82.3	259.8
La Union	90.5	29.4	34.3	154.2	9.5
Leyte	120.1	62.0	80.5	262.6	42.7
Marinduque	40.3	.8	10.2	51.3	....
Masbate	32.2	6.4	15.0	53.6	....
Mindoro	19.0	41.3	6.1	66.4	80.4
Misamis	103.5	94.6	79.6	277.7	145.3
Mountain Province	....	13.0	253.5	266.5	1,006.4
Nueva Ecija	144.6	42.1	226.1	412.8	26.7
Nueva Vizcaya	32.2	11.4	88.6	132.2	136.7
Occidental Negros	272.2	24.2	236.3	532.7	....
Oriental Negros	138.6	18.0	76.9	233.5	193.8
Palawan	....	8.5	31.5	40.0	82.0
Pampanga	196.9	51.5	86.8	335.2	....
Pangasinan	326.4	88.5	243.3	658.2	....
Rizal	161.3	25.7	7.0	194.0	18.1
Romblon	....	....	5.7	5.7	285.8
Samar	103.4	46.3	104.5	254.2	38.1
Sorsogon	85.2	65.9	29.6	180.7	....
Sulu	29.1	21.8	9.8	60.7	77.8
Surigao	46.9	2.0	13.6	62.5	....
Tarlac	113.8	7.8	57.4	179.0	27.4
Tayabas	148.2	34.1	52.0	234.3	....
Zambales	37.6	44.4	38.2	120.2	23.4
Zamboanga	58.9	19.9	52.1	130.9	128.3
Total	4,836.4	2,044.8	3,036.6	9,917.8	4,414.9

Definitions for road classification

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and, when missing, their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable during the rainy season.

Type of surfacing

	December 31, 1920.	December 31 1921.
	Kilometers.	*Kilometers.*
Stone	1,429.8	1,428.4
Gravel	3,059.4	3,210.0
Coral	1,450.5	1,460.8
Unsurfaced	3,876.4	3,818.6
Total	9,816.1	9,917.8

ROAD MAINTENANCE

Average number of kilometers maintained

	1920	1921
Caminero system	4,601.3	4,906.8
Gang system	3,030.1	3,200.3
Total	7,631.4	8,107.1

Total cost of road maintenance

	1920	1921
Caminero system	₱3,197,202.28	₱3,762,218.99
Gang system	745,351.19	746,102.24
Total	3,942,553.47	4,508,321.23

Average cost of maintenance per kilometer per year

	1920	1921
Caminero system	₱694.85	₱766.74
Gang system	245.98	233.14

The length of road designated first-class and the length of road under caminero maintenance are as nearly identical as conditions permit.

BRIDGES

Durable bridges and culverts in existence

Fiscal year ending December 31—	All durable structures.	
	Total number.	Increase during year.
1916	7,156	516
1917	7,370	214
1918	7,426	56
1919	7,491	65
1920	7,521	30
1921	7,481	83

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The decrease in the number of structures in 1921 over last year is due to the fact that many structures lost or destroyed in previous years are reported for first time this year. The above figures are obtained from semi-annual reports of District Engineers.

Reinforced concrete structures in existence

Fiscal year ending December 31—	Total number.	Total meters span.
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280

NOTE.—All reinforced concrete structures were built during the American régime, together with a large number of steel and other classes of construction.

BUILDINGS

The figures in the tabulation below exclude all structures of less than 100 cubic meters content.

Durable buildings completed

Fiscal year ending December 31—	Total number.	Total content cubic meters.	Per cent rein forced concrete by content.
1916	112	261,496	85
1917	82	160,888	70
1918	84	220,943	56
1919	76	159,254	64
1920	82	229,653	65
1921	148	363,735	71

Buildings, in the above tabulation, are classified as reinforced concrete when the outside walls, or, in the case of markets, the interior posts, are of that material.

Number of markets and schools completed

Calendar year—	Markets and tiendas.	Schools.
1916	17	67
1917	15	32
1918	19	27
1919	11	19
1920	12	47
1921	25	79

ARTESIAN WELLS

Successful deep wells driven, by fiscal year

1917	108
1918	165
1919	163
1920	148
1921	125

Since the year 1904 when the first artesian wells were drilled in an experimental way, until the end of the year 1921 when the popularity of this work became an undisputed fact, a total of 1,368 successful artesian wells have been drilled, supplying potable water to the inhabitants of the Philippines. This does not include the unsuccessful wells, which number 163.

Amounts expended in wells

	1921		1920	
	Pesos.	Per cent.	Pesos.	Per cent.
Successful wells	338,770.54	91	432,013.18	93
Unsuccessful wells	33,481.12	9	35,331.68	7
Total	372,251.66	100	467,344.86	100

Average cost of drilling per meter: ₱28.51, 1921; ₱28.88, 1920.

Summary of deep well drilling, 1921

	Number.	Total depth in meters.	Total flow in liters per minute.
Successful:			
Flowing	43	5,800	9,251
Pumping	82	5,844	7,545
Total:			
Successful	125	11,644	16,796
Unsuccessful	9	1,415	....

Percentage of unsuccessful wells drilled: 7, 1921; 10, 1920.

The drilling operations for the year started with 28 deep well rigs in the field and 4 machines in the Property Division awaiting assignment. The personnel for the operation of these machines consisted of 27 well drillers, 9 supervising well drillers, 1 district superintendent and 1 general field superintendent. Of the 4 machines awaiting assignment 1 is a large Standard Rig not suitable for the drilling of water wells except in emergency cases and the other 3 were not placed in operation until the latter part of April, due partly to the shortage of well drillers to operate them and also to the delay of municipalities and provinces in forwarding the proper resolutions.

In June 1921, when the funds allotted for the drilling of artesian wells were nearly exhausted, due to the reversion by the Emergency Board of the unreleased amount of ₱90,000 appropriated for this purpose, an order was issued to all but six well drillers in the field to stop drilling operations as soon as the well on which they were actually working was completed. As a result of this policy the activities of this section were practically at a standstill during the balance of the year. However additional funds were made available during the month of November, thereby enabling this Bureau to operate 19 machines in the month of December.

Activities of the artesian wells section for the year ending December 31, 1921

Month.	No. of machines in operation.	Remarks.	No. of machines laid up.	Remarks.
January	28	Ten machines drilling for private parties.	4	Three unassigned and one stored at Property Division.
February	28	Eleven machines drilling for private parties.	4	Do.
March	28	Eight machines drilling for private parties.	4	Do.
April	26	Six machines drilling for private parties.	6	Two new ones unassigned and 4 laid up for repairs.
May	27	Four machines drilling for private parties.	5	Four laid up for repair, one unassigned.
June	27	Three machines drilling for private parties.	5	Do.
July	28	.....do	4	Four laid up for repairs.
August	17	One machine drilling for private parties.	15	Eight laid up in provinces, four laid up for repairs, and 3 stored in Manila.
September	8	.....do	24	Four laid up for repairs, 17 stored up in provincial stations, and 3 stored in Manila.
October	8	Two machines drilling for private parties.	24	Do.
November	8	Three machines drilling for private parties.	24	Do.
December	19	.....do	13	Four laid up for repairs, 5 stored up in provincial stations, and 4 stored in Manila.

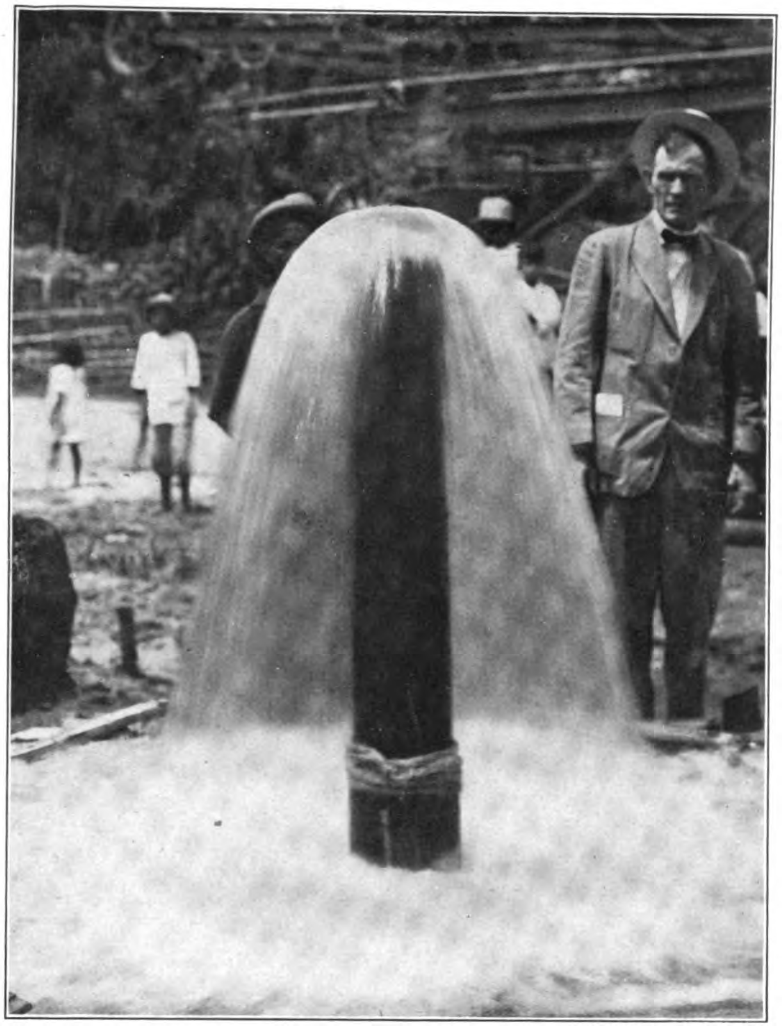
In spite of this handicap 132 wells were completed during the year aggregating 42,646 feet in depth. Of these, 125 wells were successful and will furnish potable water to approximately 316,584 people.

Cebu has been the most fortunate province; 31 wells having been drilled there during the year, 28 of which have proved successful; Batangas comes second with 25 wells drilled, 20 of which have proved successful.

Two of the wells drilled during this year have proven to be record breakers; one of these, drilled at Moncada, Tarlac, flows 900 gallons per minute, and the other, drilled at Urdaneta, Pangasinan, flows 500 gallons per minute.

The average cost of drilling wells in 1921 was ₱8.69 per foot, including materials and supplies, depreciation of equipment and other charges such as labor, transportation, etc.

Three calyx drills which will be used in connection with the work of the Constructing Division have been taken over by this section for operation. They are now ready for field work, with a competent operator available, when so required.



Flowing artesian well, Moncada, Tarlac, P. I.; capacity: 900 gallons per minute

The Bureau of Public Works Machine Shop, due mainly to the additional machinery purchased, has been able to render satisfactory service to all the divisions of this Bureau.

During the year from January 1 to December 31, 1921, these shops completed 1,047 work orders, involving a total sum of ₱81,264.39.

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year there were 1,865 new motor vehicles registered and 11,476 re-registered, or a total of 13,341, as compared with 13,493 registered in the previous year. Of the 1917 motor vehicles previously registered which were withdrawn from operation 88 were reported unserviceable.

In the licensing of operators, 2,000 applicants were examined and 1,595 new licenses issued. Including renewals, 16,859 drivers were licensed to operate motor vehicles.

ACCIDENTS AND FINES

The following will show the results of the campaign conducted during the year against unreliable chauffeurs:

Number of cases reported during first quarter	563
Number of cases reported during second quarter	939
Number of cases reported during third quarter	767
Number of cases reported during fourth quarter	240
Total	2,509
Number of deaths reported during the year	16
Number of speeding cases reported during first quarter	111
Number of speeding cases reported during second quarter	153
Number of speeding cases reported during third quarter	76
Number of speeding cases reported during fourth quarter	38
Total	378

Accidents and fines—Continued

Percentage of speeding cases during first quarter . . . . per cent. .	19.7
Percentage of speeding cases during second quarter . . . . do. . .	16.3
Percentage of speeding cases during third quarter . . . . do. . .	9.9
Percentage of speeding cases during fourth quarter . . . . do. . .	15.8
Number of licenses suspended during the year	186
Number of licenses revoked during the year	6
Number of convictions with imprisonment	8
Total amount of fines collected (by the courts) during the year	₱56,080.00

Provisions of the automobile laws most commonly violated

Number of violations.	Sections and Acts violated.
378 (speeding)	Section 4, Act 2389
262 (lights)	Section 2, Act 2639
538 (exceeding capacity and allowing passengers on running boards	Section 9, Act 2587
106 (smoke)	Section 36, Act 2159
600 (failure to sound horn)	Section 30, Act 2159

A circular to all district engineers relative to the limiting of speeds of motor vehicles operated on all public highways has been drafted and will be submitted to the Department of Commerce and Communications at an early date for approval. The importance of such a circular cannot be over-estimated, considering the fact that without proper speed restrictions the highways are bound to suffer excessive damage which, no doubt, would result in a very high maintenance and reconstruction cost, and the further fact that the provincial road funds available are in many cases inadequate to keep the highways in proper condition of repair.

COLLECTIONS AND EXPENDITURES

The funds collected during the year under the existing laws were ₱207,275.53, as against ₱177,263.24 for 1920. The amount expended for the registration of motor vehicles and for the carrying out of the provisions of motor vehicle laws was ₱64,000.

BENGUET AUTOMOBILE LINE

The Benguet Automobile Line operated during the year eleven (11) touring cars, six (6) passenger trucks, and six (6) freight trucks, and handled during the same period 3,766 first-class passengers, 4,866 third-class passengers, 92,160 kilos of hand-baggage, 885,142 kilos of express and freight, and 60,548 kilos of dead-head express and freight.

THE USE OF THE BENGUET AND NAGUILIAN ROADS

It will be noted from the following summary of traffic over the Benguet and Naguilian Roads for the last three years—1919, 1920 and 1921—that the volume of traffic over both roads has greatly increased during the year 1921, which fact demonstrates conclusively the growing popularity of Baguio both in and outside of the Philippines, as a health resort.

Summary of traffic over the Benguet and Naguilian Roads

BENGUET ROAD

Year.	Pedestrian.	Bull carts.	Animals led or ridden.	Calesas.	Motorcycles.	Automobiles.	Trucks.	Wagons.
1919	7,475	6,227	6,161	1	72	2,743	3,511	12
1920	6,609	2,095	6,378	. . . .	302	3,792	2,377	91
1921	20,666	10,831	6,668	1	606	4,728	3,390	85

NAGUILIAN ROAD

Year.	Pedestrian.	Bull carts.	Animals led or ridden.	Calesas.	Motorcycles.	Automobiles.	Trucks.	Wagons.
1919	16,984	10,531	1,607	16	171	3,320	4,703	240
1920	9,123	5,823	530	7	252	2,796	4,283	1,078
1921	15,725	11,052	1,908	40	275	3,704	7,785	55

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Acting Chief Constructing Engineer*

ROADS

During 1921 greater attention to road maintenance was necessary because of the ever increasing volume of traffic and the lack of proportionate increase in provincial road and bridge revenues.

As anticipated in the 1920 Annual Report of this Bureau, very little new road construction was accomplished during 1921, and unless the present system of road financing is so altered as to provide additional funds, even further curtailment of new road construction will be necessary.

The total number of kilometers of first-class roads as of December 31, 1921, was 4,836.4, compared with 4,698.8 kilometers of first-class roads in existence at the end of the year 1920, or an increase of 137.6 kilometers, the greater portion of which was accomplished with Insular funds.

Tabulation of the increase in road kilometerage during the year 1921, by provinces

Province.	Roads in existence December 31, 1920.	Roads in existence December 31, 1921.	Increase during the year 1921.
	Kms.	*Kms.*	*Kms.*
Abra	48.2	49.0	0.8
Agusan	16.6	17.3	0.7
Antique	94.5	104.4	9.9
Baguio	39.3	41.2	1.9
Batangas	179.0	184.2	5.2
Benguet	74.3	75.3	1.0
Bohol	185.2	185.3	0.1
Cagayan	49.9	54.5	4.6
Capiz	169.7	179.8	10.1
Cavite	84.4	82.2	[a](2.2)
Cebu	291.5	295.5	4.0
Cotabato	11.5	12.8	1.3
Ilocos Norte	78.2	78.4	0.2
Ilocos Sur	160.3	165.6	5.3
Iloilo	259.6	266.0	6.4
Isabela	81.1	79.9	[b](1.2)
Laguna	146.9	147.9	1.0
Lanao	25.9	30.4	4.5
La Union	80.8	90.5	9.7
Leyte	117.8	120.1	2.3
Masbate	. . . .	32.2	[*]32.2
Misamis	99.2	103.5	4.3
Mountain Province	4.0	. . . .	[c](4.0)
Nueva Ecija	139.0	144.6	5.6
Occidental Negros	266.4	272.2	5.8
Oriental Negros	133.7	138.6	4.9
Pampanga	192.1	196.9	4.8
Pangasinan	309.3	326.4	17.1
Rizal	157.5	161.3	3.8
Sorsogon	113.7	85.2	[d](28.5)
Sulu	34.2	29.1	[e](5.1)
Surigao	44.9	46.9	2.0
Tarlac	104.0	113.8	9.8
Tayabas	137.2	148.2	11.0
Zambales	32.3	37.6	5.3
Zamboanga	55.9	58.9	3.0
Total	. . . .	. . . .	137.6

[a] Decrease due to reclassification.
[b] Decrease due to elimination of section of road subject to flood.
[c] Decrease due to incorporation of this road to Province of Ilocos Sur.
[d] Decrease due to separation of Masbate.
[e] Decrease due to order of Director to reconstruct a section of this road.
[*] Three and seven-tenths (3.7) kilometers new construction.

NOTE.—No new road construction was completed or undertaken in the province not listed above.

San Jose North Road (Bitadton–Pandan), Province of Antique. This road starts from kilometer 91.5 and connects with the Antique-Capiz interprovincial road at kilometer 117.5, giving a total length of 26 kilometers. Of this distance, 3½ kilometers were completed and declared first-class during the year. In addition to this, first- and second-course stones were spread and rolled over a distance of 5½ kilometers of the subgrade, and first-course stones spread over 4½ kilometers more. When completed, this road will greatly facilitate the interprovincial commerce between Capiz and Antique.

Sibalom–San Remigio Road, 10 kilometers long, Antique Province. The remaining unfinished 2 kilometers of this road were completed and declared first-class during the year. With the completion of this road, the transportation of the products of the interior town of San Remigio to the port of San Jose is greatly facilitated.

Antique–Iloilo Road, 23.5 kilometers long, connecting the two provinces thru the towns of San Joaquin, Iloilo, and San Jose, Antique. During the year 4½ kilometers have been completed and declared first-class, and 3 kilometers made second-class on the Antique side, thus making a total of 7½ kilometers of continuous road passable throughout the year.

Tuguegarao–Isabela Road, 13.26 kilometers long, Province of Cagayan. The remaining unfinished 3.2 kilometers of this road were completed and declared first-class before the end of the year. This makes traveling by motor cars now possible from Alcala, Cagayan, to Cabagan, Isabela, a distance of approximately 65 kilometers.

Aparri–Lal-lo Road, 20 kilometers long, Province of Cagayan. The entire subgrade of this road was completed in previous years. This year the surfacing of 1.78 kilometers was done and this much of the road has been declared first-class. First-course stones have been placed on 2.5 kilometers more; also 3,750 cubic meters of rock have been purchased and crushed in the Government crusher at Cagayan, and are being transported to the road.

Pamplona–Pasacao Road, length, 11.3 kilometers. This road is the connecting link between the Manila Railroad terminal at Pamplona, Camarines Sur, and the town of Pasacao, the port of call of the Railroad's boat on the west coast of this province. This boat makes water connection with the Railroad Station at Aluneros in the Province of Tayabas. With this new road, trips from Manila to the Provinces of Camarines Sur and Albay can now be made in less than twenty four hours. The work of reconstructing this old Spanish road, which passes through a rolling country covered with hemp, rice, and cocoanut plantations, was started on February 6, 1921. In order to complete the work on time with the ₱50,000 appropriated for the purpose, so that it could be used when the railroad opened its new route, only a 3-meter metalling was constructed. The surfacing work was completed on October 5, 1921, and the road was opened to traffic immediately afterwards.

Ivisan–Banga Road, 66 kilometers long, connecting the municipalities of Ivisan and Banga in the Province of Capiz. The work on this road was started at both ends in June 1921, and so far, 7 kilometers of subgrade on the Banga side and 7.5 kilometers on the Ivisan side, or a total of 14.5 kilometers of subgrade, have been completed. Also, five (5) concrete pipe culverts were installed on the Banga side and four (4) wooden bridges constructed on the Ivisan side before the close of the year. When completed, this road will connect the great district of Acklan with that of Capiz.

Cabugcabug–Pilar Road, 11.1 kilometers long, Capiz Province. The original distance on the old location between the municipalities of Cabugcabug and Pilar has been reduced one-half kilometer by a relocation of the section between the barrios of Lutod-lutod and Culilang. The subgrade on this new location has been constructed, and the surfacing of 6.6 kilometers of the road completed, thereby leaving only 4.5 kilometers of subgrade to be surfaced.

Capiz–Panay Road, 7.1 kilometers long, Capiz Province. During the year 1.1 kilometers were completed and declared first-class. In addition to this, first- and second-course stone was spread and rolled over a distance of 1.5 kilometers, and first-course stone spread over 1.8 kilometers more of the road.

Loctugan–Ivisan–Sigma Road, 21.2 kilometers long, Capiz Province. The length of road under construction is 5.3 kilometers, the rest having been completed in previous years. Of these 5.3 kilometers, 2.9 kilometers were completed and declared first-class during the year, thereby leaving only 2.3 kilometers to be surfaced when additional funds become available. A 4-meter reinforced concrete box culvert was constructed at kilometer 11.3.

Cotabato–Tamontaka Road, 6.2 kilometers long, Province of Cotabato. The first-class reconstruction of this road has been carried out as far as kilometer 5.75, leaving only 450 lineal meters uncompleted.

Davao South Road, 161 kilometers long, Province of Davao. This is the most important road project in the Province of Davao, as it will pass through extensive hemp and cocoanut plantations and other big tracts of fertile agricultural lands awaiting cultivation on the west coast bordering on the Gulf of Davao. It will connect the town of Davao, the capital of the province, with the municipality of Santa Cruz and the municipal district of Malita. During the year, 7 kilometers of new subgrade, and 7 temporary wooden bridges between kilometer 8 and kilometer 21 were constructed, and 7 old temporary bridges were repaired at Santa Cruz and Bulatakay.

Bangui–Claveria Trail. A new trail, 5 kilometers long, was constructed during the year, which, together with the sections completed in previous years, makes a total distance of 51.8 kilometers of finished trail, with a minimum width of 1½ meters. This leaves only 8.2 kilometers of new trail to be opened, and when completed, a good horse-trail will have been established from the end of the automobile road at Bangui, Ilocos Norte, to Claveria, Province of Cagayan, which would greatly stimulate the emigration of excess population of the Ilocos provinces to the great Cagayan Valley.

Maintenance of first-class road, Tuguegarao–Iguig Road, Cagayan, P. I.

Tagudin–Sevilla Boundary Road, 8.8 kilometers long, Province of Ilocos Sur. The remaining 1.3 kilometers, unfinished, section of this road was completed during the year. This section is a part of the Manila North Road.

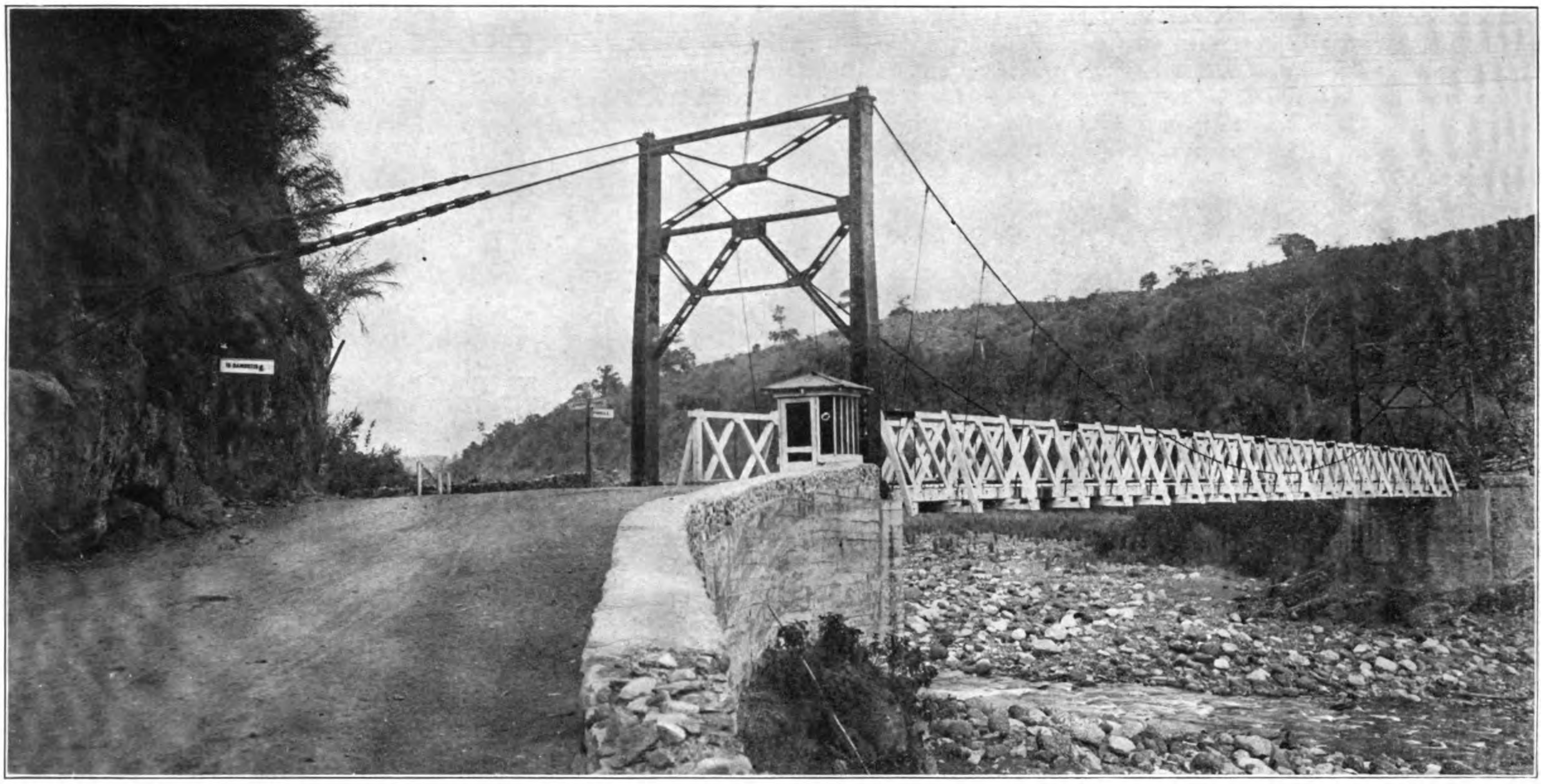
Guimbal–Igbaras Road, 9 kilometers long, Province of Iloilo. The subgrade of this road has been completed to within ½ kilometer of Igbaras. First-course stone has been placed and rolled on 1¾ kilometers of the road.

Iligan–Misamis Boundary Road, Province of Lanao. This road is 14 kilometers long, with the subgrade entirely completed. Two (2) kilometers were surfaced with gravel during the year. The completion of this road will greatly develop the northern coastal plain of the Province of Lanao, which already has a large area developed in cocoanut and sugar plantations.

Misamis North Road, connecting the towns of Misamis, Clarin, Tudela, Jimenez, Aloran, Oroquieta, Plaridel and Balĭangao, on the west section of the Province of Misamis. This is an old Spanish road 94 kilometers long, of which 10.1 kilometers were constructed first-class in previous years, 38.5 kilometers are second-class, and the rest is a trail. During this year the following work was accomplished: Grading work was completed from kilometer 88.5 to kilometer 91; one collapsible wooden bridge over the Oroquieta River was constructed, and the section from kilometer 42 to kilometer 43.75 was converted into a first-class road. The Jimenez–Beach second-class, 1.5 kilometers long, was also converted into a first-class road.

Naujan–San Agustin Road, 3.4 kilometers long, connecting the municipality of Naujan with the barrio of San Agustin in the Province of Mindoro. This road starts at kilometer 2.8 of the Naujan–Jolo road and ends in the barrio of San Agustin. The work was started in June 1921, with an appropriation of ₱3,000, of which sum ₱1,000 was donated by the municipality of Naujan. Two and nine-tenths (2.9) kilometers of subgrade have been constructed. When completed, this road will greatly benefit the people living in the town of Naujan and those living in the barrio of San Agustin.

Cabanatuan–Boñgabong Road connecting the towns of Cabanatuan and Boñgabong through the Government Stock Farm at Atate, Prov-



Bued River Bridge, Camp One—Damortis Road. La Union, P. I.

Span, 200 feet. Cost ₱24,300

ince of Nueva Ecija. The total length of this road is about 28 kilometers. The work was started early in 1921. Owing to the frequent rains in this section of the country only two kilometers of grading have been completed and one kilometer of road surfaced and rolled. Two Armco iron pipe culverts, one meter in diameter, have also been installed. When completed this road will benefit not only the towns of Cabanatuan and Boñgabong but also those of Rizal and Laur, as well as the Insular Stock Farm at Atate and the Hacienda Sabani.

San Jose–Santa Fe Interprovincial Road.—The following was accomplished during 1921: The 1-meter trail from kilometers 191 to 198 and from kilometers 206.5 to 209.5 was widened to a width varying from 3 to 5 meters; eleven (11) kilometers of standard subgrade 6 meters wide was completed; from kilometer 176.5 to kilometer 187.5, fifteen (15) temporary bridges and culverts were constructed, five (5) concrete pipe culverts were installed, and the subgrade of a diversion road, 540 meters in length, leading to the barrio of Puncan was constructed in exchange for the right-of-way donated by the inhabitants of said barrio; 1,417 cubic meters of first-course gravel were delivered on the section kilometer 174 to 186; 1,200 lineal meters of first-course surfacing was spread to a width of 2½ meters and rolled; 10,000 cubic meters of slides were removed; and surveys for the proposed bridges over the Digdig and Kabulinawan Rivers were made.

Bayombong–Santa Fe Road, Province of Nueva Vizcaya, connecting with the San Jose–Santa Fe Road. This road is third-class at present and is 49 kilometers in length. Its conversion into a first-class road is estimated to cost approximately ₱490,000, exclusive of bridges. The work of reconstructing this road was started in November 1921, and grading work is under way on kilometers 4, 5, 6 and 7. When completed this road will form a part of the trunk road which will connect the Cagayan Valley with the Manila North Road.

Dumaguete North Road, approximately 117 kilometers long, from Dumaguete to Guijulngan, Province of Oriental Negros. Sixty-nine and seven-tenths (69.7) kilometers of this road were constructed first-class in previous years. During this year grading work was accomplished on kilometers 68, 69 and 83, and surfacing work on kilometers 62, 63, 111 and 112.

Isabela–Guijulngan Road, connecting the two Negros provinces through the towns of Isabela, Occidental Negros and Guijulngan, Oriental Negros. During this year 5 kilometers of subgrade were surfaced, and a new subgrade, 4 kilometers long, was constructed on the Isabela side.

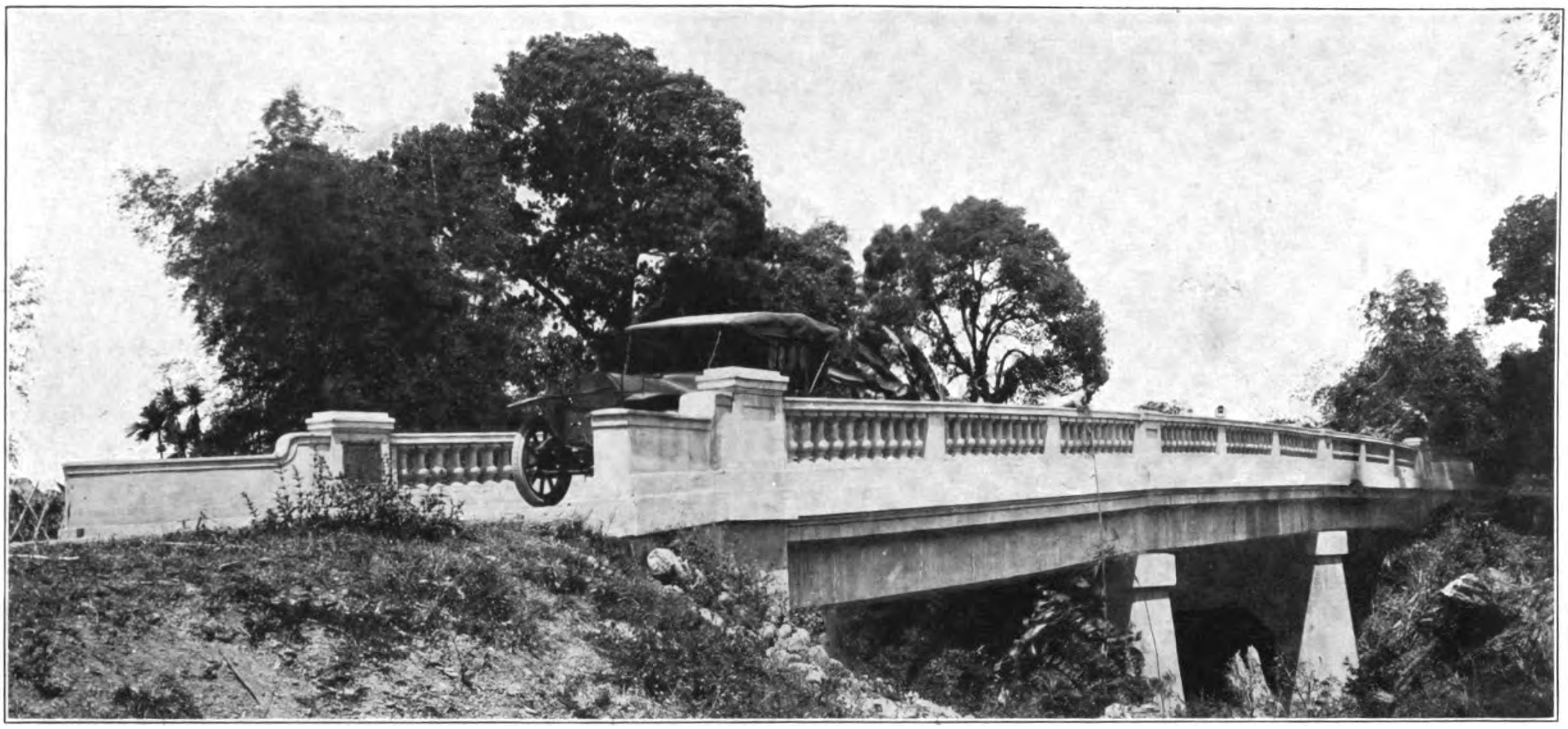
Pampanga–Bataan Interprovincial Road, 16.8 kilometers long, connecting the road system of Bataan Province with that of Pampanga Province. The work done during the year on this road consisted of completing the metalling of the section from kilometer 99 to kilometer 105, and the construction of two wooden bridges, one of 6.10-meter span at kilometer 94.70 and another of seven 6.10-meter spans at kilometer 98.90. Small dikes have also been constructed on the downstream shoulder of the road at kilometers 91, 92, 93 to prevent the erosion of the surfacing on these sections in time of floods. The entire road has been declared first-class, but the sections from kilometer 91.4 to kilometer 95.5 and from kilometer 96.6 to kilometer 97.2, will have to be paved with concrete, when additional funds are made available, because they remain under water a great deal of the time during rainy season.

Alaminos–Bani Road, 15 kilometers, Province of Pangasinan. Fourteen (14) kilometers of this road have been subgraded, of which 1 kilometer has been completed firs-class, and 3.5 kilometers surfaced with first-course stone. The completion of this road will promote commercial intercourse between the towns of western Pangasinan and those of central and eastern Pangasinan, which are already connected with a net-work of improved roads.

San Jacinto–San Fabian Road, 8.4 kilometers long, Province of Pangasinan. With the exception of about 500 lineal meters at the San Fabian end, the subgrade of this road is practically completed. The surfacing of 2 kilometers has been finished and first-course gravel placed on 5 kilometers more.

Malasiqui–Santa Barbara Road, 6.9 kilometers long, Province of Pangasinan. Three (3) kilometers of first-class construction and 4.9 kilometers of first-course gravel surfacing have been accomplished during the year.

Urdaneta–Asingan Road, 11.4 kilometers long, Province of Pangasinan. A section of subgrade 3.6 kilometers long, of which 1.7 kilometers have been surfaced and declared first-class, was constructed



Mango Bridge, Montalban, Rizal, P. I.

Three, 9-meter spans. Cost ₱22,613

during the year. This will be a short-cut road from Asingan to the towns of southern Pangasinan.

Morong–Pililla Road, connecting the municipalities of Morong and Pililla, in the Province of Rizal. This road is a continuation of the Manila East Road, and has a length of 12 kilometers. The work of reconstructing this old Spanish road was started in May 1921 and the entire length of 12 kilometers has been metalled. The shoulders, however, will have to be improved, when more funds become available, to afford proper protection to the metalled portion of the road.

Murcia–Capas Road, 8 kilometers long, Province of Tarlac. The entire subgrade of this road was completed and the first two kilometers surfaced and declared first-class during the year. This road is a section of the Manila–Tarlac Road.

Tiaong–Dolores Road, 9.7 kilometers long, Province of Tayabas. Seven and one-tenth (7.1) kilometers of this road have been completed and declared first-class, of which 6.1 kilometers were constructed during this year.

San Antonio–San Narciso Road, a portion of the Iba–South Road, Zambales Province, connecting the municipalities of San Antonio and San Narciso, a distance of 8.5 kilometers. Of this, 3.8 kilometers have already been completed as a first-class road.

BRIDGES

While bridge construction has been somewhat curtailed during the year 1921 due to shortage of funds, it has been possible, nevertheless, to construct a few important structures.

Benguet.—The Bued River Suspension Bridge on the Damortis Railroad Station–Baguio Road makes possible the crossing of the Bued River during the rainy season and therefore affords an uninterrupted, all-the-year route, between Damortis Railroad Station and Baguio. The bridge has a span of 200 feet and is suspended on steel towers. Erection of this structure was started July 1, 1921, and was completed by the end of the year. The work was done by administration and cost ₱24,300.

Bulacan.—The Hagonoy River Bridge is a reinforced concrete slab and girder bridge on reinforced concrete piles having five 9-meter spans and two approach spans of 2 meters each, 4.88-meter clear roadway, with a 1.25-meter sidewalk on each side. This bridge connects the towns of Sto. Rosario and Hagonoy, and although only 96 per cent complete, has been opened to foot traffic.

Cavite.—The work of constructing the Imus River Bridge met with considerable difficulties, due principally to lack of proper equipment and shortage of funds. At the end of August 1921, this project was only 53 per cent complete. It was not till the month of October that the bridge was finished and opened to traffic. It consists of three 63.5-foot wooden Howe truss spans, supported on reinforced concrete pile bents. It cost ₱52,737.

Occidental Negros.—The construction by contract of the Talaban Diot River Bridge at kilometer 78.4 of the Bacolod South Road, Occidental Negros, consisting of ten 7.50-meter reinforced concrete slab and girder spans, supported on reinforced concrete pile bents, was 80 per cent complete at the end of the year. All the pile bents have been finished and 50 per cent of the slabs and girders placed. It is expected that the bridge will be completed and opened to traffic during the month of February 1922.

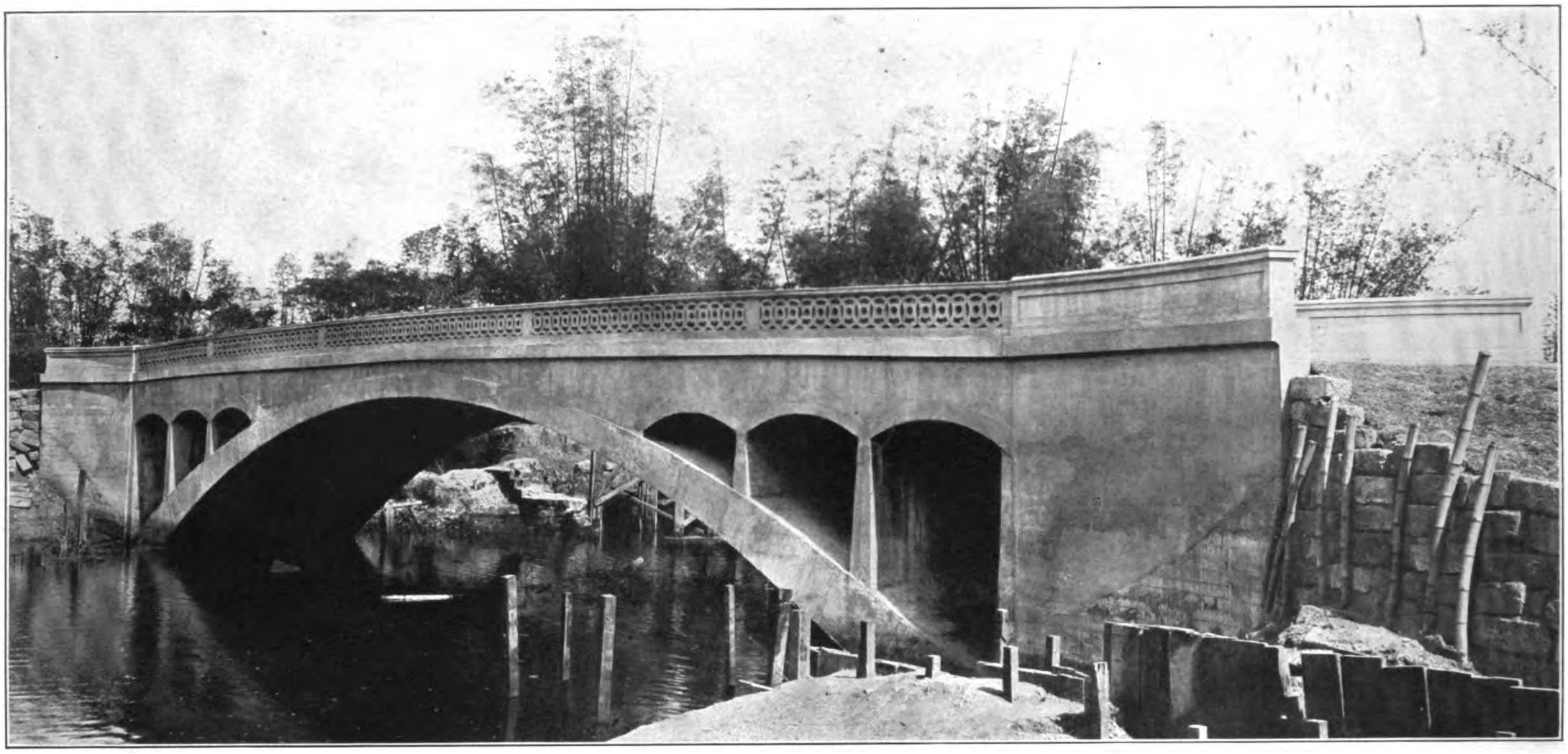
Pampanga.—The Abacan River spillway, concrete, 232 meters long, on the Angeles–Mabalacat Road, was 82 per cent complete at the end of the year and opened to traffic. The estimated cost of this structure is ₱35,000, as against ₱100,000, if a bridge is built to span the same river. The work is being done by administration.

Pangasinan.—The construction by administration of the Bued River Bridge at kilometer 176 of the Manila North Road was started in November, and by the end of the year the excavation for the foundation had been completed. It consists of one 11-meter reinforced concrete slab and girder span resting on reinforced concrete U-abutments.

The Catablan River Bridge under construction last year at kilometer 213 of the Urdaneta–Calasiao Road, consisting of five 9-meter reinforced concrete slab and girder spans, supported on reinforced concrete pile bents, was completed at a cost of ₱53,240.

Rizal.—Construction of the Dampalit River Bridge, a six 9-meter reinforced concrete slab and girder structure supported on reinforced concrete pile bents, was started on March 5, 1921, and was completed and the bridge opened to traffic before the end of the year. It cost ₱49,000. The bridge is located on the Malabon–Obando Road between kilometers 15 and 16. The work was done by contract.

The Mango River Bridge, at kilometer 33 on the Mariquina–Montalban Road, was started in January 1921, and was completed and opened to traffic during the year. This bridge consists of three 9-meter reinforced concrete slab and girder spans supported on rein-



Zapote Bridge, between Rizal and Cavite Provinces, P. I.

Span, 30 meters, cost ₱73,955

forced concrete piers. It cost ₱22,613. The work was done by contract.

The construction by administration of the Zapote River Bridge, a 30-meter reinforced concrete arch, at the boundary line between the Provinces of Rizal and Cavite, on the Manila–Cavite Road, was completed and the structure opened to traffic during the month of September; total cost, ₱73,955.

Tayabas.—A 70-meter concrete spillway has been constructed at kilometer 124 of the Manila South Road at a cost of ₱20,623. It has been found to be a great improvement over the unimproved crossing which formerly became clogged with boulders and driftwood during heavy rains. Traffic can now pass this point without any difficulty immediately after the subsidence of a flood.

The following table shows the number of permanent bridges and concrete spillways completed or under construction in the various provinces during 1921:

Important permanent bridges and spillways constructed in 1921

Province and road.	Name.	Km. No.—	Type.	Spans.	Roadway in meters.	Cost.
Benguet:						
Damortis R. R. Station–Baguio Road	Bued River suspension bridge	249.6	Suspension on steel towers	One 61-meter	2.135	₱24,300
Bulacan:						
Malolos–Hagonoy–Sto. Rosario Road	Hagonoy River bridge	53.9	R. C. slab and girder on R. C. pile bents.	5 of 9-meter	4.88	₱43,823, 95 per cent complete Dec. 31, 1921.
Cavite:						
Manila–Cavite Road	Imus River bridge	20.5	Wooden Howe truss on R. C. pile bents.	3 of 20-meter	2.85	₱53,727
Occidental Negros:						
Himamaylan–Cabancalan Road	Talaban Diot River bridge (askew).	78.4	R. C. slab and girder on R. C. pile bents.	10 of 7.5-meter	4.88	₱60,550, 80 per cent complete Dec. 31, 1921.
Pampanga:						
Angeles–Mabalacat Road	Abacan River concrete spillway	92.23	Reinforced concrete spillway	Length: 232 meters	5.00	₱26,310, 80 per cent complete Dec. 31, 1921.
Pangasinan:						
Manila North Road	Bued River bridge	176	R. C. slab and girder on U-abutments.	One 11-meter	4.88	₱ 7,431, 2 per cent complete Dec. 31, 1921.
Urdaneta–Calasiao Road	Catablan River bridge	213.0	R. C. slab and girder on R. C. pile bents.	5 of 9-meter	4.27	₱53,240
Rizal:						
Malabon–Obando Road	Dampalit River bridge	14.5	R. C. slab and girder on R. C. pile bents.	6 of 9-meter	4.88	₱49,000
Mariquina–Montalban Road	Mango River bridge	32.31	R. C. slab and girder on R. C. piers.	3 of 9-meter	4.27	₱22,613
Manila–Cavite Road	Zapote River bridge	15.2	R. C. arch	One 30-meter	4.88	₱73,955
Tayabas:						
Manila South Road	Sampaloc concrete spillway	123.5	Concrete spillway	Length: 70 meters	4.42	₱20,623
Total expenditure for permanent bridges and spillways.						₱434,592

Power House, Bureau of Printing, Manila, P. I., completed June 1921

BUILDINGS

Manila.—The construction of buildings for the Insular Government in Manila was progressing satisfactorily from the beginning of the year 1921 up to the time when the financial stringency that pervaded the Islands caused the suspension of work on most of the important projects.

Among the building constuction projects which had to be suspended during the year are:

The Insular Building, which, when completed will be temporarily occupied by the Legislature;

The Nurses' Dormitory for the Philippine General Hospital; and

The addition to the Supreme Court (Arellano) Building.

Several buildings were, however, completed in Manila during the year, among which are the following:

The Executive Building, which was occupied during the entire year by the office of the Governor-General. This structure is undoubtedly the finest example of the possibilities of local materials and artisanship in the Islands today. The unit cost per cubic meter of inclosed space is very high as compared with other buildings, but it should be understood that fully fifty per cent of the cost is represented by the special marble finish, carved wood work, wrought iron work, imported electrical fixtures and sample furniture. It has been demonstrated by the results obtained in this project that although the special marble finish is preferable to the ordinary cement finish so far as appearance is concerned, the cost and difficulty of obtaining it, however, make its use inadvisable except in very special cases.

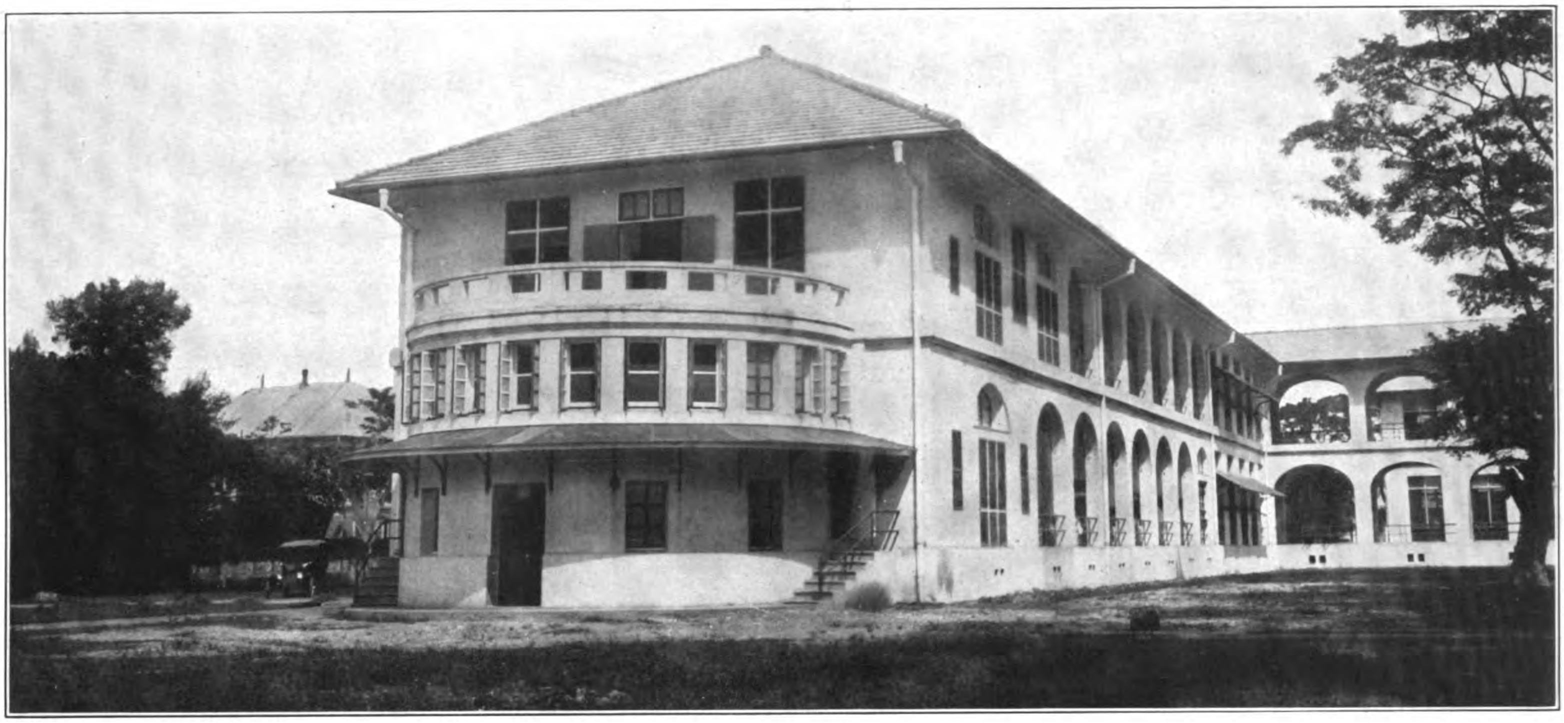
Rizal Hall, for the University of the Philippines, was completed at the close of the year 1921, except for minor work on electrical wiring. Owing to lack of funds at the beginning of the year, the work had to be temporarily suspended. On June 1st, however, the Board of Regents of the University authorized an additional allotment of ₱100,000 and requested this Bureau to have the building completed and ready for occupancy early in the following month, which required that the work be prosecuted day and night, with consequent extra expense for overtime and lights. This has, naturally, increased the total cost of the project. The building itself is an architectural duplicate of University Hall. It has steel roof framing and a reinforced concrete roof slab, overlaid with asphalt-impregnated water-proofing, with flat, inter-locking tile roofing.

The University authorities are constructing the laboratory fixtures and equipment by administration.

No work was done on the new Manila Custom-House during the year because of lack of funds.

The foundations for the new Post Office building were practically complete at the close of the year. The Atlantic Gulf and Pacific Company satisfactorily furnished and drove the 4,800 wooden piles for this job, but were obliged to omit approximately 40 piles because of the non-removal of the Meralco tracks and wires. Mr. E. A. Haley was awarded the contract to construct the concrete pile caps for these foundations, and did a very satisfactory job. It was necessary to omit that portion of the pile caps corresponding to the piles left out due to the interference of the Meralco tracks. In both instances a corresponding reduction was made from the contract price for the work omitted. This project now awaits further allotment of funds. It should be noted that the omission of a portion of the foundation will not interfere with the construction of the main building, as the footings left out are only those for the extreme southwest corner of the main entrance staircase, which can be constructed after the main building is completed.

The addition to the Bureau of Printing, which will house the Photo-Engraving Division, the Machine Shop, and the Foundry, was completed during the year.



Maternity Pavilion, showing exterior of Amphitheatre, Philippine General Hospital, Manila, P. I.

The Maternity Pavilion and the Dining Pavilion for the Philippine General Hospital were practically completed at the end of the year. The electrical work for the Maternity Pavilion was done by contract at a very low price. As a whole, this project presents a very pleasing appearance and is certainly superior to the old units.

The reconstruction of the Intendencia Building has been carried on by administration throughout the year. The entire second floor, which was formerly of wood, was removed and replaced by reinforced concrete slabs and beams. A new roof framing was constructed composed entirely of steel supported by reinforced concrete pilars and beams. This steel framing was fabricated and erected by contract at a cost of approximately ₱60,000. The roofing is of 22-gauge corrugated galvanized iron strapped to the steel purlins with 18-gauge galvanized iron straps. The ceiling joists being of steel, and the ceiling itself of asbestos, practically eliminates all the wood work formerly utilized in this structure. As all this work, involving the removal of debris and the reconstruction of the roof and the second floor, has been carried on while the first floor was occupied by various offices, the cost has been rather high and all concerned have had to exercise considerable patience. Both the Bureau of the Treasury and the Bureau of Coast and Geodetic Survey have at all times proved very considerate, in spite of the great annoyance to which they have been subjected by construction operations. It is estimated that 85 per cent of the work was completed at the close of the year 1921, and that the funds available are sufficient to finish the project early in 1922.

Philippine Constabulary Barracks, Tuguegarao, Cagayan, P. I., under construction

Provinces.—The construction of a number of important buildings was carried out in the provinces during the year, as follows:

Camalig School Building, Albay Province.—This is a Standard Plan No. 5 reinforced concrete, one-story structure measuring 45.40 m. by 12.225 m. at the front part, and 9.10 m. by 9.20 m. for the two rooms at the rear. The roofing consists of 24-gauge galvanized iron. The work was done by a local contractor at a cost of ₱44,061, including inspection and surcharges. The building was occupied by the school immediately after its completion on November 14, 1921.

Provincial Jail and Court-house Building, Bulacan Province.—This is a one-story concrete building of special design having a frontage of 41 meters and a depth of 28 meters, with a two-story projection in the central portion of the front façade 15.30 meters wide and 7.50 meters deep. There is also an open court in the interior of the main portion of the building, 28.60 meters long, and 22 meters wide. The projecting portion in the front will house the court room, the office of the Judge and that of the Fiscal. The rest of the building will house the jail proper. Inasmuch as there were not sufficient funds available to complete the entire building, only the first story has been constructed. The work of construction was started in August 1921, and at the close of the year the project was 61 per cent complete, with a total expenditure of ₱113,710.

Provincial High School Building, Cagayan Province.—This building is being constructed in Tuguegarao, the capital of the province. It is a Pasig type, Standard Plan No. 20, building measuring 51.40 meters by 44.40 meters. Construction was started in March 1921, and at the close of the year it was 70 per cent complete, with a total expenditure of ₱172,293. All the concrete work, except three concrete partitions, all the roof framing and the roofing of the main building and that of one of the wings are already completed. It is expected that this building will be completed for the opening of the school season in June 1922. When finished, this building will be the first of its kind constructed in this province for educational purposes.

Tuguegarao Constabulary Barracks, Cagayan Province.—This is a reinforced concrete, one-story structure consisting of the main

Maternity Pavilion (right), Dining Pavilion (left) and connecting Corridor, Philippine General Hospital, Manila, P. I.

building measuring 11 m. × 45.16 m., and a wing measuring 13.10 m. × 15.20 m. The floor, however, is made of wood, with the exception of the kitchen floor, which is of concrete. The inside partitions are also of wood. The entire floor area of the building is distributed as follows: front porch, 53.20 sq. m.; three sergeants' rooms at 14.44 sq. m. each; one office, 28.88 sq. m.; one store room, 14.44 sq. m.; barracks, 202.16 sq. m., reading room, 28.88 sq. m., mess room, 52.56 sq. m.; pantry and store room, 15.20 sq. m.; kitchen, 28.88 sq. m.; hospital, 19.19 sq. m.; practicante's room, 9.70 sq. m.; toilet, 19.38 sq. m; and back porch, 23.94 sq. m. The roof is covered with 22-gauge corrugated galvanized iron. This project was 88 per cent complete at the end of the year, with an expenditure of ₱38,267.

Naga Central School Building, Province of Camarines Sur.—A reinforced concrete structure 45.20 meters long by 21.20 meters wide, built in accordance with the revised Standard Plan No. 5 of the Bureau of Education. The work of construction was started in February 1921, and the building was completed on August 10, 1921, at a cost of ₱42,803. This is the first building of its kind erected in Camarines Sur. The appearance of this new type of school building has attracted the attention of several municipalities in Camarines Sur, two of which are now planning to secure funds for the erection of similar structures during the year 1922.

Davao Central School Building, Province of Davao.—This is a Standard School Building, Plan No. 10, with two additional rooms annexed to the rear of the building. The site for this building being very low, the floor elevation was raised 0.40 meter higher than what the standard plan called for. The work of construction was started in May 1921, by contract, and the building was completed at a cost of ₱65,602, and accepted by the school authorities on November 10, 1921.

Davao Hospital, Province of Davao.—This project consists of the construction of the Hospital building itself, the Nurses' Dormitory and Public Dispensary, the Doctors' Quarters, the Employees' Quarters and Garage, the Delco Light building, the sceptic tank, and the improvement of the grounds. The hospital building proper is a standard structure of the San Lazaro Hospital Type of Manila, with the addition of a rear wing for private wards, operating room and kitchen. This building has an area of approximately 615 square meters, having concrete columns, cement tile roofing, and sliding shell windows. The floor of the main ward is of wood, that of the corridor and kitchen is of concrete, while that of the operating room is of white glazed tiles of the best quality. The largest of the other buildings is the Nurses' Dormitory, 18.30 meters by 19 meters, one-half of which will be used as the Nurses' Dormitory and the other half as a public dispensary. The Employees' Quarters and Garage measures approximately 8.80 meters by 11.55 meters, while the Doctors' Quarters contains an area of approximately 72 square meters. All of these buildings have concrete posts up to the floor line, wooden floors and siding, and galvanized iron roofing. The work on the whole project was practically completed at the end of the year, with the exception of the painting, which could not be done except on the main hospital building, due to lack of funds. The total expenditures at the end of the year amounted to ₱142,860.21, and the project was then 95 per cent complete.

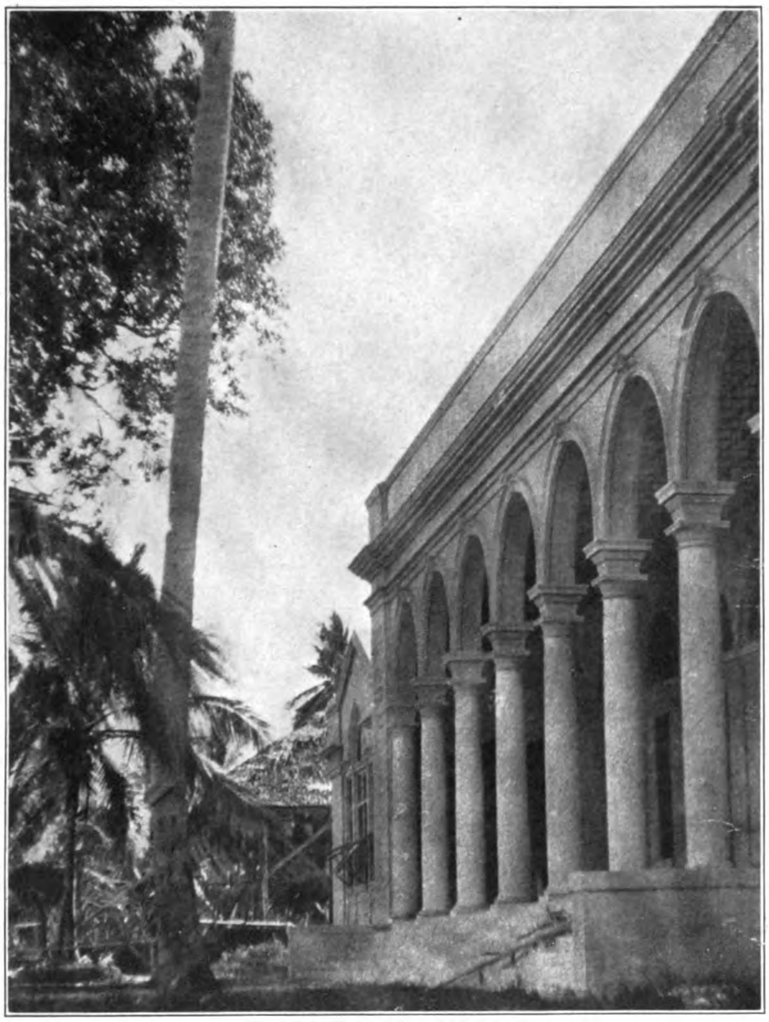
Davao Constabulary Barracks, Province of Davao.—This building is of exactly the same type as the Constabulary Barracks being constructed in Tuguegarao, Cagayan, hereinbefore described. It was completed at the end of the year, with the exception of the painting, which is expected to be finished by the 15th of January, 1922. The expenditure to date has amounted to ₱49,512.

Vigan Constabulary Barracks, Province of Ilocos Sur.—As in the case of Davao, this building is exactly the same as the Tuguegarao Constabulary Barracks. It was 75 per cent complete at the end of the year, with an expenditure of ₱43,093.

Bangued High School, Province of Abra.—This is a Standard Plan No. 20, Pasig Type, one-story building, measuring 44.40 m. × 51.40 m. The foundation and exterior walls are of concrete, and the floor of wood, concrete, and tiles. The roof is of corrugated galvanized iron. This project was 66 per cent complete at the end of the year, with an expenditure of ₱60,323. Work has been suspended due to lack of funds.

Dumaguete High School Building, Oriental Negros.—This building is patterned after Standard Plan No. 20, Pasig Type, with a modified façade 51.40 by 44.40 meters. With the exception of the ceiling in the assembly room, which is of pressed steel, the concrete

Naga Central School, Bureau of Education, Revised Plan No. 5, Camarines Sur, P. I.



Facade, Dumaguete High School, Oriental Negros, P. I.

railing around the courtyard, the wooden partitions between the class rooms and the electric wiring, the Pasig Type Plan was followed in the construction of the building. It is located in the new area designated as the town's Civic Center.

Deaf and Blind School Building, Rizal Province.—This building is of special design, two stories high, with concrete walls, wooden interior partitions, galvanized iron roofing on wood framing, wooden floors, and shell windows, with wrot iron grilles on all first story windows. The main portion of the building is 38.20 meters by 10.80 meters, and the two wings are each 28.80 meters by 10 meters. The work of construction was started in February 1921, and at the close of the year it was 98 per cent complete. The total appropriation for this building is ₱225,000, and the expenditure to date ₱211,623.54. It is estimated that this project can be carried to completion with the funds available.

Standard concrete school buildings have also been built in the following municipalities of Rizal Province: Pateros, 4-room building, 95 per cent complete, expenditure ₱27,685; Pasay, 11-room building, cost ₱71,930; Tanay, 4-room building, 98 per cent complete, expenditure ₱28,022; Morong (Tomas Claudio Memorial School), 4-room building, cost ₱27,291; and Caloocan, 7-room building, 95 per cent complete, expenditure ₱31,005.

Girls' Dormitory Building, Province of Tayabas.—This is a reinforced concrete two-story structure consisting of the main building 11 m. × 31.40 m. and one wing 10 m. × 11.35 m., with galvanized iron roofing. The building is located on the high school grounds in Lucena, the capital of the province. The work was 98 per cent complete at the end of the year, with an expenditure amounting to ₱83,050.

Zamboanga Normal School Building, Province of Zamboanga.—This is a specially designed two-story concrete structure, 30.6 meters × 53.9 meters with Spanish clay title roof. It is considered as one of the most beautiful and artistically designed school buildings in the Philippines. All lumber used in the building is yacal, with the exception of the auditorium floor, which is of alternate boards of molave and ipil. The entrance lobby, corridor and rear terrace floors are of red tile. The electrical installation includes lights, fans, stage footlights, moving picture and spot-light connections, and an electric clock and bell system. The toilet rooms are equipped with granolithic marble partitions and nickle-plated plumbing fixtures. All hardware and plumbing fixtures were imported direct from the United States; also, a stage drop curtain. The receipt of an additional allotment of ₱30,500 in September permitted resumption of work, which was suspended last May, and the building is complete at this writing except for the electrical wiring and the electrical clock system, which was let by contract to H. E. Keeler Co., of Manila. The building was occupied on October 15, 1921. The total expenditures at the end of the year amounted to ₱401,735.

Domestic Science Building, Province of Zamboanga.—This is a one-story reinforced concrete building, 11.20 meters × 17.50 meters, built in accordance with a Bureau of Education plan, except that the building has ornamental concrete balustrades around the porch, clay tile roofing and a concrete chimney, and that a large cooking range and modern plumbing fixtures are included. All lumber used in the building is yacal, with the exception of the flooring and ceiling, which are lumbayao. The floors of the porch, bath-room, and kitchen are of red cement tile. This building was completed at a total cost of ₱25,705, and was occupied by the Domestic Science School in November.

In spite of the increased cost of materials and shortage of funds, the usual school, market, presidencia, hospital, and miscellaneous building construction, was carried out during the year, and at its close, a total of 148 permanent buildings had been added to those in existence in previous years, classified as shown in the following tables:

HOSPITALS

Province.	Municipality.	Number of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Davao	Davao	1	Concrete–Tile roof	35.50 × 13.50, main building 13.50 × 13.50, rear wing 2.70 × 10.88, passageway 5.40 × 8.10, kitchen	6,956	₱143,081.69
Manila	Manila, San Lazaro	1	Concrete–Concrete roof	13.50 × 37.20, 2 stories	3,456	154,738.99
Mountain	Ifugao	1	Stone–Shingle roof	11.98 × 23.00, 2 stories	2,783	21,997.88
Total		3			13,195	319,818.56

SCHOOL BUILDINGS

Province.	Municipality.	No. of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Albay	Camalig	1	Concrete–G. I. roof, Plan No. 5	21.20×45.20, 1 story	4,081	₱44,045.38
Antique	Dao	1	Concrete–G. I. roof, Plan No. 6	9.00×17.50, 1 story	3,297	29,333.21
Batangas	Calaca	1	Concrete–G. I. roof	9.20×32.20, 1 story	1,554	20,075.80
Do	Bauan	1	Wood–G. I. roof	7.00×14.00, 1 story	382	6,549.60
Do	Bolboc	1	Wood–G. I. roof	7.00×14.00, 1 story	382	6,436.92
Bohol	Pilar	1	Wood–G. I. roof	8.60×17.20, 1 story	512	6,766.24
Do	Maribojoc	1	Concrete–G. I. roof	21.20×39.20, 1 story	4,177	30,587.50
Do	Buenavista	1	Concrete–G. I. roof	9.00×23.00, 1 story	803	12,707.43
Bulacan	Obando	1	Concrete–G. I. roof	12.00×20.80, 2 rooms 9.20×14.20, 1 story.	2,062 2,158	38,579.80
Camarines Norte	Labo	1	Wood–G. I. roof	7.50×18.20, 1 story	1,016	9,978.34
Camarines Sur	Naga (Girls' Dormitory)	1	Wood–G. I. roof	20.00×22.50, 1 story	1,855	12,751.61
Do	Nato, Sagnay	1	Wood–Certainteed roof	8.00×21.00, 1 story	1,092	7,736.06
Do	San Jose, Pili	1	Wood–G. I. roof	6.00×28.00, 1 story	1,085	11,373.19
Do	Naga	1	Concrete–G. I. roof	21.20×45.20, 1 story	4,880	42,802.84
Capiz	Capiz	1	Concrete–G. I. roof	21.30×51.30, 1 story	5,400	53,167.37
Do	Capiz Provincial High School	1	Concrete–G. I. roof, Pasig type.	44.40×51.40, 1 story	12,300	169,080.39
Do	Pontevedra	1	Concrete–G. I. roof	21.20×39.20, 1 story	4,177	36,118.82
Cotabato	Cotabato	1	Wood–G. I. roof	14.00×40.00, 1 story	2,938	18,058.13
Davao	Davao	1	Concrete–G. I. roof	28.20×39.20, 1 story	9,396	65,602.52
Do	Bagangas	1	Concrete–G. I. roof	14.20×39.20, 1 story	4,731	38,804.07
Ilocos Sur	Santa Maria	1	Concrete–G. I. roof	14.00×32.00, 1 story	3,608	25,809.51
Do	Santa Catalina	1	Concrete–G. I. roof	9.20×32.20, 1 story	1,857	14,357.40
Isabela	Ilagan Intermediate School	1	Wood–G. I. roof	14.76×23.22, 1 story	1,828	10,072.42
Do	Cabagan	1	Concrete–G. I. roof	14.20×39.20, 1 story	3,755	37,729.04
Laguna	San Nicolas	1	Concrete–G. I. roof	9.20×23.20, 1 story	1,531	14,216.77
La Union	Bauang	1	Concrete–G. I. roof	14.20×39.20, 1 story	3,546	23,897.70
Do	Bacnotan	1	Concrete–G. I. roof	21.20×39.20, 1 story	4,412	37,416.80
Manila	Manila Engineering Laboratory, U. P.	1	Concrete–Flat G. I. roof	13.00×46.00, 1 story	2,390	87,802.68
Marinduque	Boac	1	Concrete–G. I. roof	14.20×51.60, 1 story	3,605	43,875.83
Do	Santa Cruz	1	Concrete–G. I. roof	12.10×47.40, 1 story	2,774	24,363.85
Mindoro	Calapan	1	Concrete–G. I. roof	15.50×51.40, 1 story	4,628	75,071.06
Misamis	Taguluan	1	Concrete–G. I. roof	14.20×32.20, 1 story	2,458	26,674.90
Do	Misamis	1	Concrete–G. I. roof	14.20×39.20, 1 story	3,109	41,008.76
Nueva Ecija	Cabanatuan	1	Wood–G. I. roof, Plan No. 7	14.20×39.20, 1 story	3,525	9,906.48
Nueva Vizcaya	Dupax	1	Concrete–G. I. roof, Plan No. 7	14.20×39.20, 1 story	3,525	23,824.64
Do	Bayombong	1	Wood–G. I. roof	12.00×24.00, 1 story	1,210	4,501.69
Occidental Negros	Silay	1	Wood–G. I. roof	21.20×51.30, 2 stories	8,071	32,611.70
Do	Fabrica	1	Wood–G. I. roof	9.00×32.00, 2 stories	1,930	6,954.12
Oriental Negros	Siaton	1	Concrete–G. I. roof, Plan No. 7	14.20×39.20, 1 story	3,525	26,284.66
Do	Bais	1	Concrete–G. I. roof, Plan No. 10	21.20×39.20, 1 story	4,177	34,586.26
Do	Dumaguete High School	1	Concrete–G. I. roof, Plan No. 20, Pasig type.	44.40×51.40, 1 story	12,759	132,270.80
Pampanga	Arayat	1	Concrete–G. I. roof, Plan No. 16.	21.20×39.20, 1 story	4,177	38,493.91
Do	Mexico	1	Wood–G. I. roof, Plan No. 6	9.00×17.50, 1 story	764	6,470.00
Do	Porac	1	Wood–G. I. roof	14.20×32.20, 1 story	3,202	22,910.58
Do	Santa Rita	1	Concrete–G. I. roof, Plan No. 10.	21.20×39.20, 1 story	4,177	37,565.84
Pangasinan	Natividad	1	Concrete–G. I. roof	14.20×39.20, 1 story	3,525	27,726.26
Do	Santa Barbara	1	Concrete–G. I. roof	14.20×39.20, 1 story	3,525	27,021.60
Do	Mangatarem	1	Concrete–G. I. roof, Plan No. 7	14.20×39.20, 1 story	3,525	28,743.53
Do	Lingayen (Dumalandan)	1	Concrete–G. I. roof, ¾ of Plan No. 7.	14.20×30.20, 1 story	3,118	19,816.61
Do	Sison	1	Concrete–G. I. roof, Plan No. 4	9.20×32.20, 1 story	1,903	18,971.96
Rizal	Morong	1	Concrete–G. I. roof, Plan No. 5, 5 rooms.	12.10×45.20, 1 story	3,063	27,000.00
Do	Pasay	1	Concrete–G. I. roof, Plan No. 5, 11 rooms.	39.20×45.20, 1 story	6,094	67,000.00
Do	Cainta	1	Wood–G. I. roof, Plan No. 4-A	9.15×32.15, 1 story	1,958	14,500.00
Samar	Catarman Dormitory No. 3	1	Wood–G. I. roof	9.20×32.20, 1 story	707	8,364.00
Do	Palapag	1	Concrete–G. I. roof, Plan No. 7	14.20×39.20, 1 story	3,525	34,534.31
Sorsogon	Sorsogon	1	Concrete–G. I. roof	10.40×41.10, 1 story	2,599	23,981.69
Sulu	Maimbong, Jolo	1	Wood–Malthoid roof	15.20×32.00, 1 story	2,957	37,086.20
Surigao	Tandag	1	Concrete–G. I. roof	14.20×52.20, 1 story	3,360	26,322.30
Do	Surigao	1	Concrete–G. I. roof	21.20×49.20, 1 story	5,935	41,916.98
Tayabas	Lucban	1	Concrete–Certainteed roof	7.20×12.95, 1 story	266	4,242.03
Do	Dolores	1	Concrete–G. I. roof, Plan No. 4	10.20×30.00, 1 story	1,189	21,127.50
Do	Lopez	1	Concrete–G. I. roof, Plan No. 15 (omitting 9 back rooms).	1—12.175×20.60, 2—9.40×14.40 2—11.675×27.60, 1 story.	5,451	61,341.06
Zamboanga	Zamboanga Dormitory School building.	1	Concrete–Clay tile	11.20×17.50, 1 story	992	25,704.53
Total		63			213,513	2,005,331.18

In addition to the permanent school buildings listed above, the following temporary buildings were also constructed during the year:

TEMPORARY SCHOOL BUILDINGS

Province.	Municipality.	No. of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Antique	Sibalom	1	Wood–Nipa roof, Plan No. 3	9.20×23.20, 1 story	1,352	₱1,947.07
Camarines Norte	Daet	1	Wood–Nipa roof, Plan No. 7	14.20×39.20, 1 story	3,525	20,309.98
Camarines Sur	Goa	1	Wood–Nipa roof	12.00×20.80, 1 story	1,680	9,503.64
Cebu	Ronda	1	Wood–Nipa roof, Plan No. 4	10.20×30.00, 1 story	1,966	8,619.52
Do	San Remigio	1	Wood–Nipa roof, Plan No. 4	10.20×30.00, 1 story	1,966	3,754.31
Iloilo	Iloilo	1	Wood–Nipa roof	1—20.60×49.05, 2—9.40×36.40 1 story.	2,970	17,463.60
Oriental Negros	Dumaguete	2	Wood–Nipa roof	2—12.20×15.24, 1 story	2,617	11,171.35
Pangasinan	Lingayen	1	Wood–Nipa roof	9.00×21.00, 1 story	1,465	2,197.55
Samar	Capul	1	Wood–Nipa roof	8.00×21.00, 1 story	1,100	7,325.65
Do	Almagro	1	Wood–Nipa roof	8.00×21.00, 1 story	1,100	5,906.71
Do	Balangiga	1	Wood–Nipa roof, Plan No. 3-A	8.00×21.00, 1 story	1,100	7,071.11
Do	Oquendo	1	Wood–Nipa roof, Plan No. 3-A	8.00×21.00, 1 story	1,100	6,347.81
Do	Santo Niño	1	Wood–Nipa roof, Plan No. 2-A	9.00×14.00, 1 story	622	4,410.71
Do	Lavezares	1	Wood–Nipa roof, Plan No. 3-A	8.00×21.00, 1 story	1,100	5,603.17
Do	San Antonio	1	Wood–Nipa roof, Plan No. 3-A	8.00×21.00, 1 story	1,100	5,970.37
Total		16			24,763	117,602.55

MARKETS AND TIENDAS

Province.	Municipality.	No. of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Albay	Albay	1	Concrete columns–G. I. roof	12.00×39.00	1,750	₱14,918.33
Batangas	Bauan (tiendas)	1	Concrete single–Flat G. I. roof	6.00×20.70	496	6,549.60
Bohol	Calape	1	Concrete columns–G. I. roof	18.00×42.00	2,268	21,870.53
Do	Tagbilaran	1	Concrete columns–G. I. roof	18.00×43.00	2,268	21,432.73
Camarines Norte	Daet	1	Concrete columns–G. I. roof, Type A.	21.00×43.50	5,361	35,400.00
Do	Indan	1	Concrete columns–G. I. roof, Type A.	21.00×43.50	5,361	35,093.88
Camarines Sur	Tigaon	1	Concrete columns–G. I. roof, Type A.	21.00×36.10	4,527	22,637.50
Do	Iriga	1	Concrete columns–G. I. roof	12.20×40.70	2,686	28,888.62
Capiz	Dao	1	Concrete columns–G. I. roof	18.00×34.00	2,770	20,307.18
Cebu	Toledo	1	Concrete columns–G. I. roof	18.00×38.00	3,785	18,544.15
Cotabato	Cotabato	1	Concrete columns–G. I. roof	15.00×39.00	2,230	21,865.60
Ilocos Sur	Tagudin	1	Concrete columns–G. I. roof	12.00×30.00	2,646	13,351.66
Iloilo	Pototan	1	Concrete columns–G. I. roof, Type A.	24.00×53.90	6,150	41,312.83
Laguna	Los Baños	1	Concrete columns–G. I. roof	15.00×23.00	1,505	14,200.00
Lanao	Iligan	1	Concrete columns–G. I. roof	15.00×31.00	1,780	10,781.67
Misamis	Misamis	1	Concrete columns–G. I. roof	12.00×21.00	1,086	11,755.86
Nueva Ecija	Cabanatuan	1	Concrete flat–G. I. roof	7.00×48.00	1,176	19,841.08
Occidental Negros	Cadiz	1	Concrete columns–G. I. roof	18.00×38.00	3,933	23,460.20
Do	Talisay	1	Concrete columns–G. I. roof, Type A.	21.00×36.10	4,982	24,880.53
Do	Silay	1	Concrete columns–G. I. roof	30.00×43.50	4,481	38,683.60
Oriental Negros	Luzuriaga	1	Concrete columns–G. I. roof	15.00×23.00	1,462	16,000.01
Rizal	Pasig	1	Concrete columns–G. I. roof, Type B.	24.00×42.80	5,150	32,129.24
Sorsogon	Irosin	1	Concrete columns–G. I. roof, Type A.	21.00×36.10	3,409	28,309.68
Total		23			75,262	522,214.48

In addition to the permanent market and tienda buidings listed in the foregoing, the following temporary buildings were constructed during the year:

TEMPORARY MARKETS

Province.	Municipality.	No. of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Cotabato	Maganoy	1	Wood posts–Nipa roof	15.00×45.00	3,750	₱2,695.54
Do	Tamontaka	1	Wood posts–Nipa roof	12.00×50.00	2,820	2,721.69
Total		2			6,570	5,417.23

PRESIDENCIAS

Province.	Municipality.	No. of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Cagayan	Peñablanca	1	Concrete–G. I. flat	18.00×15.00, 1 story	983	₱21,449.47
Camarines Norte	Labo	1	Concrete–G. I. roof	8.60×17.60, 2 stories	1,461	20,544.05
Do	Daet	1	Concrete–G. I. roof	9.70×20.70, 2 stories	1,912	36,395.34
Do	Indan	1	Concrete–Tile roof	8.45×16.45, 2 stories	1,367	22,188.43
Camarines Sur	Goa	1	Concrete–Flat G. I. roof	9.70×19.40, 2 stories	1,724	29,369.99
Do	San Jose, Pili	1	Wood–G. I. roof	6.00×28.00, 1 story	1,085	11,373.19
Capiz	Dao	1	Wood–G. I. roof	8.60×17.20, 2 stories	1,500	19,030.94
Davao	Tukbuk	1	Wood–G. I. roof	9.14×13.41, 1 story	745	11,484.13
Do	Kingking	1	Wood–G. I. roof	9.14×13.41, 1 story	745	11,484.13
Laguna	Luisiana	1	Concrete–G. I. roof	8.10×16.10, 2 stories	1,043	16,262.19
Nueva Ecija	Cabiao	1	Wood–G. I. roof	8.60×17.20, 2 stories	1,141	19,253.99
Oriental Negros	Siaton	1	Concrete–G. I. roof	8.20×14.20, 2 stories	1,046	15,408.67
Pangasinan	Urbiztondo	1	Wood–G. I. roof	10.50×13.50, 2 stories	1,502	12,346.14
Tayabas	Candelaria	1	Concrete–G. I. roof	8.60×17.20, 2 stories	1,197	21,824.45
Total		14			17,451	268,413.11

In addition to the permanent presidencia buildings listed above, the following temporary presidencia building was also constructed:

TEMPORARY PRESIDENCIA

Province.	Municipality.	No. of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Benguet	Tublay	1	Wood-cogon roof	10.90×18.90, 1 story	1,535	₱3,320.74

MISCELLANEOUS

Province.	Municipality.	No. of buildings.	Type and kind.	Principal dimensions in meters.	Contents in cu. meters.	Cost.
Batangas	Balayan	1	Concrete columns–G. I. roof, Matadero.	7.60×9.60, 1 story	283	₱1,895.20
Do	Tanawan	1	Concrete columns–G. I. roof, Matadero.	7.60×15.60, 1 story	414	6,129.12
Bohol	Tagbilaran	1	Wood–G. I. roof, Provincial warehouse.	5.10×30.00, 1 story	440	4,678.20
Do	....do	1	Concrete columns–G. I. roof, Band stand.	17.20 diameter ×6.32 high, 1 story.	104	2,100.27
Bukidnon	Malaybalay	2	Wood–G. I. roof, Office and residence for Division Superintendent of Schools.	1—12.50×14.00, 2 stories 1—5.50×13.50, 1 story	933	18,058.73
Bulacan	Marilao	1	Wood–G. I. roof, Bathhouse	15.59×23.00, 1 story	2,456	22,791.39
Do	Sibul, San Miguel	1	Concrete–Tile roof, Bathhouse	3.10×13.10, 1 story	154	897.21
Camarines Norte	Daet	1	Concrete columns–G. I. roof, Matadero.	8.90×12.70, 1 story	544	5,025.86
Cebu	Kawit	1	Wood–G. I. roof, Cabin barracks.	15.00×29.50, 1 story	2,998	22,625.47
Cotabato	Port Lebak	4	Concrete–G. I. roof and Malthoid roof, Radio Station.	6.40×8.40 6.40×8.40 4.40×6.40 8.50×18.00 All 1 story	1,277	14,233.66
Davao	Davao	1	Wood–G. I. roof, Government cottage.	7.00×13.00, 1 story	537	5,067.11
Do	Mati (Radio Station)	4	Wood–G. I. roof for employees' quarters and storehouse; white asbestos for operating and power houses.	8.155×18.00 6.00×8.00 6.00×8.00 4.00×6.00 All 1 story	1,028 345 345 134	23,794.67
Do	Mati	1	Wood–G. I. roof, P. C. Jr. officers' quarters. (One story building).	6.30×8.60, main building 2.50×3.50, rear wing 3.66×6.10, kitchen	651	7,218.55
Ilocos Norte	Batac	1	Wood–G. I. roof, Shop building	6.00×24.00, 42 wings, each 6.00×8.00, 1 story	564	9,967.43
Iloilo	Iloilo	1	Wood–G. I. roof, Radio Station	16.16×30.00, 1 story	1,848	10,831.10
Manila	Manila	1	Concrete–G. I. roof, Power house, Bureau of Printing.	9.41×43.27, 2 stories	3,223	129,308.76
Do	Alabang, Rizal	1	Concrete–G. I. roof, Toxin Laboratory.	7.17×8.15, 1 story	292	11,096.00
Do	Alabang, Rizal	1	Concrete–G. I. roof, Pig shed	8.50×45.50, 1 story	1,547	58,786.00
Do	Manila	1	Concrete–Tile roof, Executive Building.	30.10×55.42, 2 stories	9,824	1,312,180.16
Mountain Province	Bontoc	1	Brick–G. I. roof, Dining room and kitchen, Hospital.	9.00×31.00, 1 story	1,519	20,637.04
Do	....do	1	Brick–G. I. roof, P. C. Jr. officers' quarters.	11.00×14.00, 1 story	1,078	12,000.00
Nueva Ecija	Cabanatuan		Wood-Certainteed roof, P. C. barracks.	10.00×30.00, 1 story	1,080	10,567.67
Palawan	Puerto Princesa	1	Wood–G. I. roof, P. C. officers' quarters.	7.50×11.40, 1 story	360	2,861.59
Do	Cuyo	1	Wood–G. I. roof, Post Office	400×8.00, 1 story	147	2,979.00
Do	Balabac	4	Wood–G. I. roof and asbestos roof, Radio Station.	4.00×6.00 6.45×8.45 8.15×18.15 6.45×8.45	1,208	32,708.58
Rizal	Pasig	1	Wood–G. I. roof, P. C. barracks.	22.80×45.60, 1 story	3,414	35,905.61
Do	....do	1	Wood–G. I. roof, P. C. officers' quarters.	10.00×16.00, 1 story	793	16,000.00
Sulu	Bongao	4	Wood–G. I. roof and Malthoid roof, Radio Station.	6.00×8.00 6.00×6.00 8.00×18.00 4.00×6.00, all 1 story	1,772	26,145.26
Tayabas	Lopez	1	Concrete columns–G. I. roof, Matadero.	12.00×21.00, 1 story	794	19,123.80
Zamboanga	Zamboanga	1	Concrete–G. I. roof, Power house, Hydro-Electric Plant.	11.90×12.20, 1 story	1,247	15,200.00
Do	....do	1	Wood–Clay tile, Caretakers' cottage, Zamboanga waterworks.	9.45×9.45, 1 story	563	8,775.28
Do	....do	1	Concrete–Concrete, bath house	6.10×14.60	338	6,100.00
Total		45			44,314	1,875,729.52

PORT WORKS CONSTRUCTION AND IMPROVEMENT

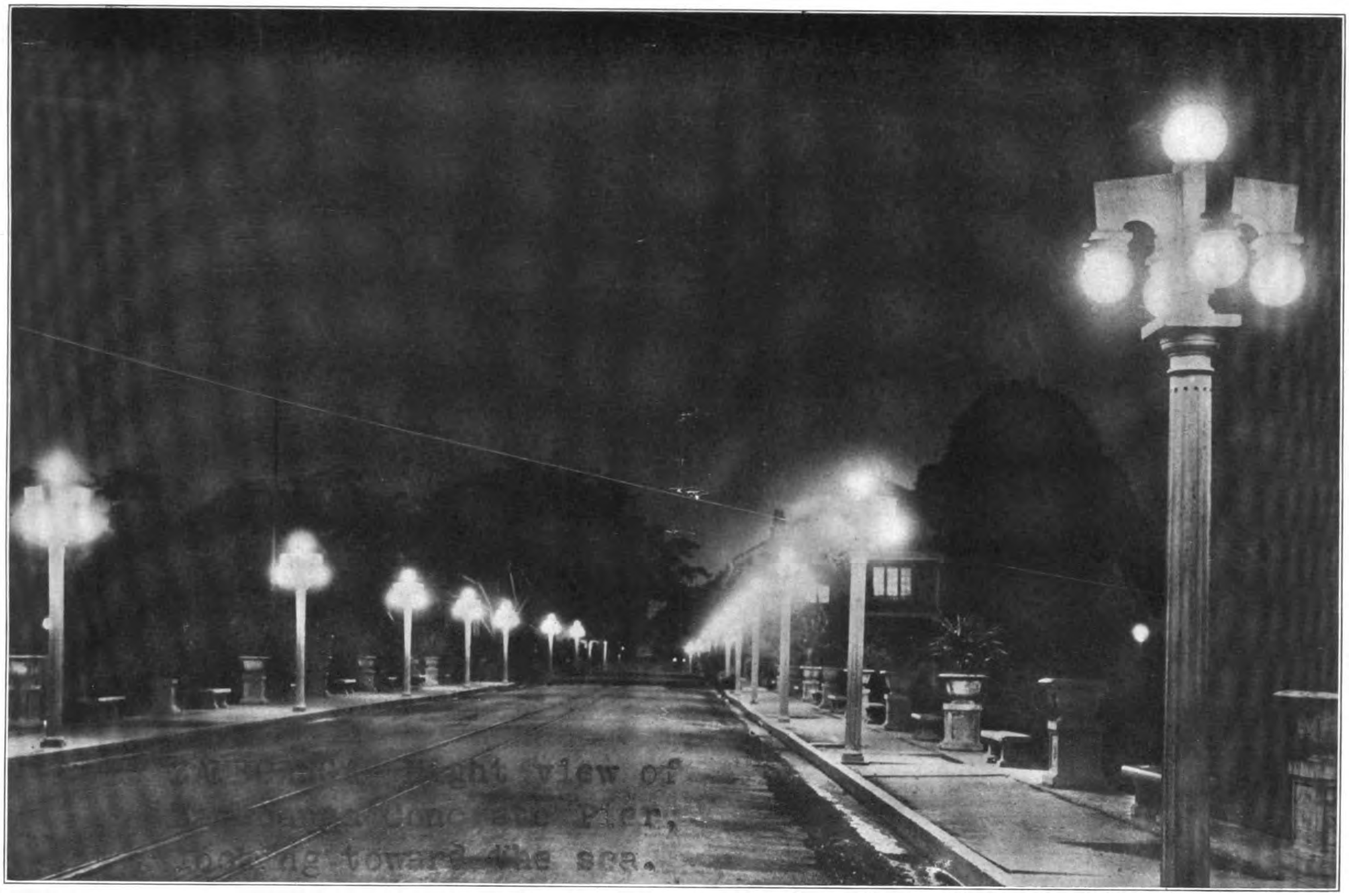
Manila.—(See Designing Division's Report.)

Bohol.—Improvement of the Port of Laoay was made by the construction of four beacons, which were completed before the end of the year, and two of the four jetties required, which were 50 per cent complete at the end of the year.

On the causeway at Tagbilaran Wharf, 3,300 cubic meters of rocks were placed for riprapping and for filling. The causeway is 490 meters long and 8 meters wide at the top.

Cagayan.—The work contemplated for the Aparri seashore protection is the construction of eight (8) timber groins spaced about 100 meters apart along the shore of the town of Aparri, extending from a point on the shore opposite the extreme eastern part of the town to the front of the church, a distance of about 1,200 meters. The groin unit, as originally planned, consists of wooden sheet piles driven between concrete piles, each groin to be placed perpendicular to the shore line. About ₱23,000 was made available during the latter part of the month of June, and construction work was immediately started, taking advantage of the short period of good weather. Groin No. 1 was 97 per cent complete when bad weather came during the months of August, September and October and destroyed parts of it. Due to the partial failure of this type of groin and of those constructed in the past, the Bureau has modified the plan, introducing more reinforcement in the structure and changing the location of each groin so that it shall be perpendicular to the resultant force of the current and the prevailing winds during the northeast monsoon. The materials for two more groins are at the site and construction in accordance with the revised plans will be started as soon as good weather sets in.

Cebu.—The reclamation of the Cebu Port Area involves the filling of the area behind the new wharf. The present project is the reclamation of what is known as Area No. 1, which requires a total fill of about 270,000 cubic meters. The filling operation was started in



Night view of Concrete Pier, looking toward the sea, Zamboanga, P. I.

July 1921, and at the end of the year, approximately 134,000 cubic meters of materials had been pumped into this area.

Iloilo—The only work accomplished this year in connection with the Iloilo River Wall project is the construction of a 150-ton scow and the erection thereon of a large pile driver to be used in driving the foundation piles for the river wall. The scow alone was completed at a cost of ₱43,000.

La Union.—The completion of the San Fernando Wharf was the most important project undertaken in this province during the year. This is an L-shaped structure, the leg, or shore end of which is 6.50 meters wide by 19.87 meters long, and the foot, or water end, 12.50 meters wide by 53.70 meters long. The work done this year consisted of the following: Casting of 24 additional concrete piles and driving of 92 piles; placing of concrete caps on these piles and the pouring of 794.56 square meters of concrete slabs; driving of 84 "Pagatpat" fender piles in groups of seven, and the placing of 737.26 square meters of bituminous macadam pavement, 10 centimeters thick, on the wharf.

Zamboanga.—The construction of twenty-five (25) lineal meters of additional sea-wall, with the necessary back fill, and the casting of 50 concrete fender piles, had been accomplished towards the end of the year in connection with the construction and improvement of the Zamboanga Port Works, when the work was temporarily suspended on account of rough weather. Work will be resumed sometime in January 1922. In connection with this project, dredging work was started last December in front of the present wharf to enable foreign boats drawing 20 feet of water to berth alongside the wharf. It is proposed to dredge the harbor to a depth of 25 feet, which is expected to be completed about the middle of February 1922.

PORT WORKS MAINTENANCE

Approximately ₱180,000 was expended for the maintenance of Piers Nos. 3 and 5 and the Pasig River Walls during the year. It is becoming increasingly difficult to fix the responsibility for damage to the piers, especially with reference to the fender pile system, and, unless it can be clearly shown that such damage is due to negligence on the part of the vessel concerned, the Government should bear the entire expense of repair without question. Pending the reconstruction of Piers Nos. 3 and 5, with modern suspended fender systems, it may be necessary to resort to the importation of creosoted Oregon Pine fender piles, in spite of their high cost, because of the lack of durable local piles of proper length.

The permanent rolling doors for the Cargo Sheds were ordered from the United States and were en route to Manila at the end of the year. The Battery Charging Station for the industrial tractors and trailers for Piers Nos. 3 and 5 was installed in the new Cargo Shed. This consists of a rotary convertor and six charging panels. This plant will be operated by the Bureau of Customs.

A very considerable portion of the working time of the steamship *Dredger* has been devoted to work at Cavite for the United States Naval Station. Dredge No. 2 was also assigned occasionally to that work. The Navy authorities have always been very obliging in the matter of loaning equipment and have, of course, paid the cost of operation of all bureau equipment assigned to work for them.

The dredge *America* was placed in commission at Cebu after a long delay in securing fabricated parts and has experienced frequent trouble from breakdowns. A few changes in the dredge personnel improved its operation, but the chief trouble at Cebu appears to be due to the fact that the material to be excavated is composed of a thin layer of very coarse sharp sand, underlaid by a ledge. This material has required the frequent renewal of pump-liners and continual change of position of the dredge and pipe line. The cost per cubic meter has, therefore, averaged rather high.

Dredge No. 3 was used in an attempt to remove the bar at the mouth of the Iloilo River, but this dredge is too small and is in such poor condition that the results were unsatisfactory. The dredge *America* will be dispatched to Iloilo at the earliest possible date to remedy the conditions existing there.

The maintenance of the Lower Pasig River has been exceedingly difficult, because of lack of steel dumping scows and launches. Only two dumping scows are now in service, one of which is in bad condition. Contract was let to the Atlantic Gulf and Pacific Company for the construction of a new steel dumping scow, which should have been completed at this writing. If examination indicates that it would be uneconomical to repair Scow No. 4, it will be necessary to build at least three more scows.

Dredge No. 1 was released after a long period of time by Engineer Island and is in first-class condition. This dredge was practically reconstructed at a cost of approximately ₱140,000. The steamship *Dredger* was thoroughly overhauled at Earnshaw's Slipways and the old pumps replaced during the year, at a cost of approximately ₱130,000. Wooden scows Nos. 12 and 13 were repaired by the Bureau's own forces and the water boat and launch *Negrito* were thoroughly overhauled during the year. Contract was let for a new hull and boiler for the launch *Siasi* late in the year, and the launches *Polaries* and *Oeste* were placed on the ways for general overhauling and repairs. A crude oil engine was secured by the Designing Division for the new launch *Resolute*.

The demands for continuous service of our floating equipment have been such that proper attention to repairs has been difficult at best and sometimes impracticable. It is recommended that in future no other consideration be deemed of enough importance to warrant delay in proper docking and examination of the entire marine equipment of the Bureau. Such delay can only result in disaster and no project should be considered so urgent that the floating equipment should be sacrificed to it.

The following tabulation indicates the scope of the dredging work done during 1921:

Location.	Total amount in cubic meters for 1921.
Lower Pasig River	211,660.00
Outer Harbor	280,402.00
Upper Pasig River	21,670.00
Paco Estero	2,500.00
Outer Bar	98,081.00
Vitas Estero	32,364.00
Iloilo River	83,891.00
Cebu Harbor	134,018.00
Balete Estero	1,956.00
Tanque Estero	1,896.00
Zamboanga Pier	....
Cavite, U. S. Navy	263,712.00
Total	1,132,150.00

WIRELESS STATIONS

Due to curtailed appropriations, as a result of the retrenchment policy adopted by the Government, the construction of Radio Stations did not progress as rapidly as was desired. The following table shows the work accomplished in the matter of tower and building construction during the year:

Province and station.	Tower.		Buildings (see also Building Report).	
	Type.	Remarks.	Units under construction.	Remarks.
Cotabato: Olan	Two–100 feet wooden masts.	Materials delivered to site.	Operating house, power house, operator's quarters and store house.	Materials delivered to site. Expenditure December 31, 1921, ₱12,970.
Port Lebak	One–150 feet galvanized steel, Type E.	Completed in November, cost ₱9,200. (Approximately.)	Operating house, power house, operator's quarters and store house.	Completed in March, ₱14,146. Special contract with local lumber company.
Davao: Mati	Two–100 feet wooden masts.	Completed in November, cost ₱4,980.	Operating house, power house, operator's quarters and store house.	Completed in October, cost ₱23,975.
Palawan: Balabac	One–150 feet galvanized steel, Type B.	Completed in previous year, cost ₱8,920.	Operating house, power house, operator s quarters and store house.	Completed in December, cost ₱32,709.
Romblon: Romblon	One–150 feet galvanized steel, Type E.	Completed in August, cost ₱10,660.	Operating house, power house, operator's quarters and store house.	Pending receipt of advice from Director of Posts retitle to site.
Sulu: Bongao	One–150 feet galvanized steel, Type B.	Completed in previous year, cost ₱10,377.	Operating house, power house, operator's quarters and store house.	Completed in December, cost ₱26,145.
Cagayan de Sulu	One–150 feet galvanized steel, Type B.	Completed in previous year, cost ₱10,377.	Operating house, power house, operator's quarters and store house.	83 per cent complete. Expenditure December 31, 1921, ₱23,574.
Siasi	One–150 feet galvanized steel, Type E.	Completed in September, cost ₱10,910.	Operating house, power house, operator's quarters and store house.	25 per cent complete. Expenditure December 31, 1921, ₱12,717.
Zamboanga: Sindangan	One–150 feet galvanized steel, Type E.	Completed in November, cost ₱10,244.	Operating house, power house, operator's quarters and store house.	No funds available.

Total expenditures: Towers, ₱75,668; buildings, ₱146,053.

TELEPHONE SYSTEMS

In Davao Province about 123 kilometers of telephone lines on the east coast from Cuabo to Santa Fe, Caraga, were reconstructed during the year 121 with a view of extending the lines to the municipalities of Baganga and Cateel. These municipalities are very isolated and communication by land as well as by sea is extremely difficult. The telephone line along the Davao South Road was maintained as usual, approximately 100 subscribers having been added to the list this year. The sum of ₱5,880.59 was expended this year, which, with the expenditure of ₱82,560.08 reported in previous years, has resulted in the construction of telephone lines through the province, comprising a system 610 kilometers in length.

The telephone system in Nueva Vizcaya comprises a length of 201 kilometers, of which 165 kilometers were completed in previous years and 36 kilometers during 1921. With this system, Bayombong, the capital, is connected with all the municipalities, municipal districts, the Constabulary station at Nantanaan, the provincial sawmill at Ibung (Solano), the town of San Luis, which is the center of commercial transactions between the people of Isabela and those of Nueva Vizcaya, and two private installations, one at Bambang and the other at Bintawan, Solano.

The Puerto Princesa–Bonobono telephone line, Palawan, which when completed will cover a distance of 194 kilometers, is already constructed as far as Brook's Point, 163 kilometers from Puerto Princesa. Provincial officials can now communicate with the town officials at Brook's Point and other intermediate points.

LIGHTHOUSE CONSTRUCTION AND REPAIR

Lighthouse construction and repair work was carried on during the year as extensively as funds warranted. Present arrangements as to care and operation of aids to navigation are not entirely satisfactory, since some confusion exists by reason of the division of the work between this Bureau and the Bureau of Commerce and Industry. In order to overcome this difficulty it is suggested that a definite sum be set aside by agreement for direct disbursement by the Bureau of Commerce and Industry for the maintenance of lamp mechanisms, buoys, etc., and that a similar definite sum be also set aside for the use of this Bureau in the maintenance and construction of lighthouses and beacons. The following tabulation shows the scope and cost of the work performed during the year:

Name of station.	Location:	Work accomplished.	Cost.
San Agustin	S. E. Mindanao	Construction, 6th order lighthouse.	₱22,259.31
Sabang	San Jose, Camarines Sur.	Construction, stand concrete beacon.	5,566.52
Maasin	S. W. Leyte Island	....do	3,391.52
Cotobato	Mindanao	Construction, special concrete beacon.	1,511.10
Dagupan	Lingayen Gulf	Construction, concrete dwelling	6,572.41
Guijulngan	East Negros Islands	Construction, stand, concrete beacon.	4,003.27
Boac	S. E. Marinduque	Reconstruction, stand, concrete beacon.	2,479.10
Pasig River	Mouth Pasig River	Improvement of site	1,025.85
Sangley Point	Cavite, Cavite	General repair of station	1,074.40
San Bernardino	San Bernardino Island.	....do	8,225.25
Luzaran	Luzaran, Iloilo	Under repair	5,691.23
Salomague	Ilocos Sur	Repair wooden tower	398.10
Pata	N. Luzon Island	Repair of windows	144.15
Davao Dock	Davao, Mindanao	Construction, 50-ft. steel tower	5,045.75
Maintenance, alteration and repairs.	Various points	Repair of Opon, Canacan, travel expense and subsistence, bills submitted by Bureau of Commerce and Industry for mechanical repairs of apparatus and buoys.	19,229.69
Total			84,617.65

DESIGNING DIVISION

E. C. EARLE, *Chief Designing Engineer*

A notable change was effected in the preparations of plans during the year, in that the designs provided for the construction of the major portion of bridge and harbor projects of permanent materials, such as reinforced concrete and structural steel. This change was made possible due to the reduced prices of building materials, which permitted the Government to again build more permanent structures within the limits of the funds available.

Although the shortage of technical personnel in the Designing Division continued during the year, it was possible to meet most of the demands made upon this division for plans, especially those most vital to commerce and industry. A considerable number of plans were prepared for bridge projects, pumping and power plants, light plants, wireless station, lighthouses, tanks, buildings, and other miscellaneous structures including floating equipment, such as dredges, pile drivers, scows, etc. Studies, investigations and preliminary estimates were also made for several non-active projects.

Plans and specifications were prepared during the year, for the projects listed in Tables A to F.

TABLE A.—*Wireless towers and masts*

Project.	Location.	Type.	Height.	Remarks.
Port Lebak	Port Lebak, Cotabato, Mindanao.	Umbrella	150′-0″	Steel tower.
Romblon	Romblon, Romblon	....do	150′-0″	Do.
Sindangan	Sindangan, Zamboanga, Mindanao.	....do	150′-0″	Do.
Siasi	Siasi, Jolo, Mindanao.	....do	150′-0″	Do.
Glan	Glan, Cotabato, Mindanao.	....do	100′-0″	Timber mast.
Margosatubig	Margosatubig, Zamboanga, Mindanao.	....do	100′-0″	Do.

TABLE B.—*Bridges*

Province.	Road.	River.	Type of structure.	Remarks.
Batangas	Calaca–Balayan	Nimalas	Steel girder	Repairs.
Bulacan	San Miguel–San Juan.	San Miguel	Steel truss with approach.	Length, 140 ft.
Capiz	Navas–Pandan	Alimbo Creek	Reinforced concrete.	Length, 14 m.
Cavite	Cavite–San Roque.	Cavite causeway.	Concrete substructure, timber superstructure.	Length, 33 m.
Do	General Trias	Palubluban	Timber spans	Length, 23 m.
La Union	Camp One–Rosario.	Zaitan	Timber truss	Length, 100 ft.
Do	Rosario–Damortis.	Nilañguyan	....do	Length, 100 ft.
Laguna	Calamba–Canlubang.	Ipitan	Concrete girder	Length, 11 m.
Do	Manila–South	Bañadero	Concrete arch and approach spans.	Length, 31 m.
Do	San Antonio–Poblacion.	San Antonio	Timber trestle	Length, 18 m.
Do	Manila–South	San Cristobal	Masonry	Bank protection.
Mountain Province	Camp One	Bued	Suspension bridge.	Length, 200 ft.
Nueva Ecija	Talavera–Balos	Talavera	Concrete approach.	Extension of existing structure.
Do	San Jose–Santa Fe.	Fabulinaman	R. C. girder	Length, 30 m.
Oriental Negros	Dumaguete–South.	Dumaguete	Steel truss	160′-0″ span.
Pangasinan–N. E.	Manila–North	Bued	R. C. girder	Length, 11 m.
Tayabas	Lopez–Calawag	Talulong	....do	Length, 20 m.
Do	Sariaya–Candelaria.	Sariaya	Steel truss	Length, 90 ft.
Do	Candelaria–Tiaong.	Lagusa	....do	Length, 100 ft.

TABLE C.—*Port works*

Province.	Port.	Type of structure.	Remarks.
Antique	San Jose	Wharf	Combination concrete substructure, timber superstructure.
Agusan	Butuan	Wharf	Do.
Cagayan	Aparri	Concrete hurdles	For shore protection.
Cavite	Cavite	Concrete sea wall	Protection, Cavite causeway.
Leyte	Tacloban	Concrete wharf	Repairs.
Palawan	Puerto Princesa	Wharf	Combination concrete substructure, timber superstructure.
Romblon	Romblon	Concrete wharf	Small landing platform.
Manila	Manila	Pier No. 7	Superstructure.
Bohol	Loay	Masonry	Channel construction and shore protection.
Camarines Norte	Daet–Basud River	Dyke—Rock jetties	River control.

TABLE D.—*Electrical installations and power plants*

Province.	Location.	Type.	Remarks.
Albay	Albay	Pumping plant	Improvements.
Batangas	Taal	Gas electric plant	Repairs—new concrete installation.
Do	do	Pumping plant	Improvements.
Do	Lipa	do	Do.
Benguet	Baguio	do	Do.
Bulacan	Malolos Prison	Wiring	Interior.
Capiz	Capiz Normal School	do	Do.
Cavite	San Roque	Pumping plant	Motor driven.
Cebu	Sibonga Presidencia	Wiring	Interior.
Do	Cebu Normal School	do	Do.
Iloilo	Iloilo Normal School	do	Do.
Laguna	San Pablo Elementary School.	do	Do.
Manila	Intendencia Building	do	Do.
Do	Maternity Ward, P. G. H.	do	Do.
Do	Nurses' Dormitory, P. G. H.	do	Do.
Do	Executive Building	do	Do.
Do	Insular Building	do	Do.
Do	Post Office	do	Do.
Do	Pile driver *Mammoth*	do	Do.
Do	Bureau of Customs	Charging plant	For industrial trucks.
Mountain Province	Quiangan Presidencia	Wiring	Interior.
Do	Bontoc Presidencia	do	Do.
Nueva Ecija	Cabanatuan Normal School.	do	Do.
Do	San Jose Presidencia	do	Do.
Do	Talavera River	Hydro-electric	Plans.
Sorsogon	Irosin Presidencia	Wiring	Interior.
Zamboanga	Zamboanga Normal School.	do	Do.
Do	Zamboanga	Hydro-electric plant	Completion of plans.

TABLE E.—*Investigations, studies, reports and recommendations*

Province.	Location.	Type.	Remarks.
Batangas	Lemery	Pumping plant	Recommendations.
Benguet	Baguio	Crusher plant	Study and recommendations.
Bohol	Loboc Falls	Hydro-electric	Investigation and study.
Bulacan	Sibul Springs	Gas-electric	Recommendations.
Davao	Davao	Electric franchise	Study and recommendations.
Ilocos Norte	Laoag	Pumping plant	Recommendations.
Laguna	Los Baños	Hydro-electric and waterworks.	Investigations and study.
Manila	Manila	"Penning" motor	Study and recommendations.
Do	do	"Stewart" hemp machine.	Study and recommendations.
Marinduque	Gasan	Waterworks	Recommendation for machinery.
Nueva Ecija	Cabanatuan	Pumping plant	Recommendations.
Pangasinan	Agno River	Hydro-electric	Review and study of preliminary data.
Tayabas	Mauban	Waterworks	Recommendation for machinery.

TABLE F.—*Miscellaneous*

Floating plants.	Land plants.
Steel suction dredge, turbine driven, 20-inch line.	72-foot land derrick and pile driver.
Steel dump scow, 150 cubic meters capacity.	6-ton guy derrick.
86-foot towing launch, steam.	8-ton stiff leg derrick.
75-foot towing launch, interior combustion engine.	100-ton slipway.
150-ton rock scows.	

A considerable amount of work was undertaken by this division in connection with the installation of the Zamboanga Hydro-electric Plant, which was inaugurated on April 27, 1921, and which has been furnishing service continuously to the public since May 1, 1921, with the exception of one short interruption of nine days, due to a flaw in the water-way. The plant has a capacity of 160 Kw. The power required by Zamboanga and the surrounding territory, including Petit Barracks, has already loaded the plant up to within 15 Kw. of its hydraulic capacity. The business is proving very successful and if the rates and regulations recommended by this division are adhered to, the Board of Control of the Zamboanga Hydro-electric Plant will experience no difficulty in financing all reasonable extensions of the plant as regards territory covered or generating capacity.

An efficiency test was made on the old Lingayen steam plant, Lingayen, Pangasinan, and the Jolo–Sulu plant was inspected and recommendations made for re-arrangement of the plant and revision of methods of operation which will result in a very large annual saving to the province.

A hydraulic sluicing system was installed at the Insular Quarry at Los Baños, Laguna, for the purpose of removing débris and over-burden at the quarry site more economically. It has proved highly successful and the over-burden is being removed at considerable less cost than was possible with the former rail system.

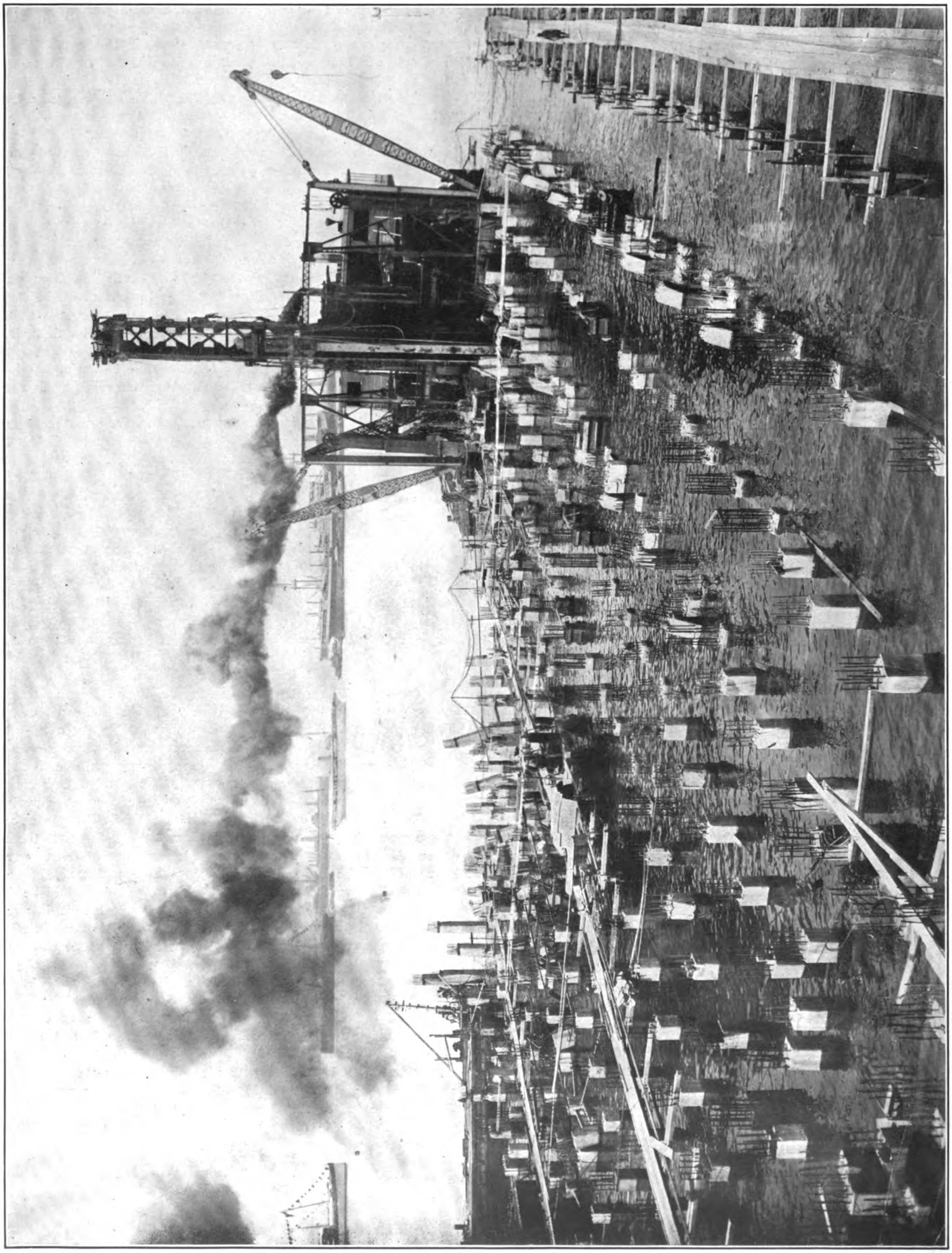
The proposed port works program for the Archipelago suffered a set-back during the year, due principally to the financial depression which was severely felt by the Government—work on many of the proposed projects for which plans had been prepared being indefinitely deferred.

Of foremost importance of the port projects, for which designs have been prepared, are the Manila harbor improvements, embracing the construction of Pier No. 7, upon which work is now well under way. The retrenchment policy brought about by the financial depression above referred to, has considerably delayed construction on this project, and unless funds from the Port Works Bond Issue can be released at an early date, it may become necessary to suspend work there.

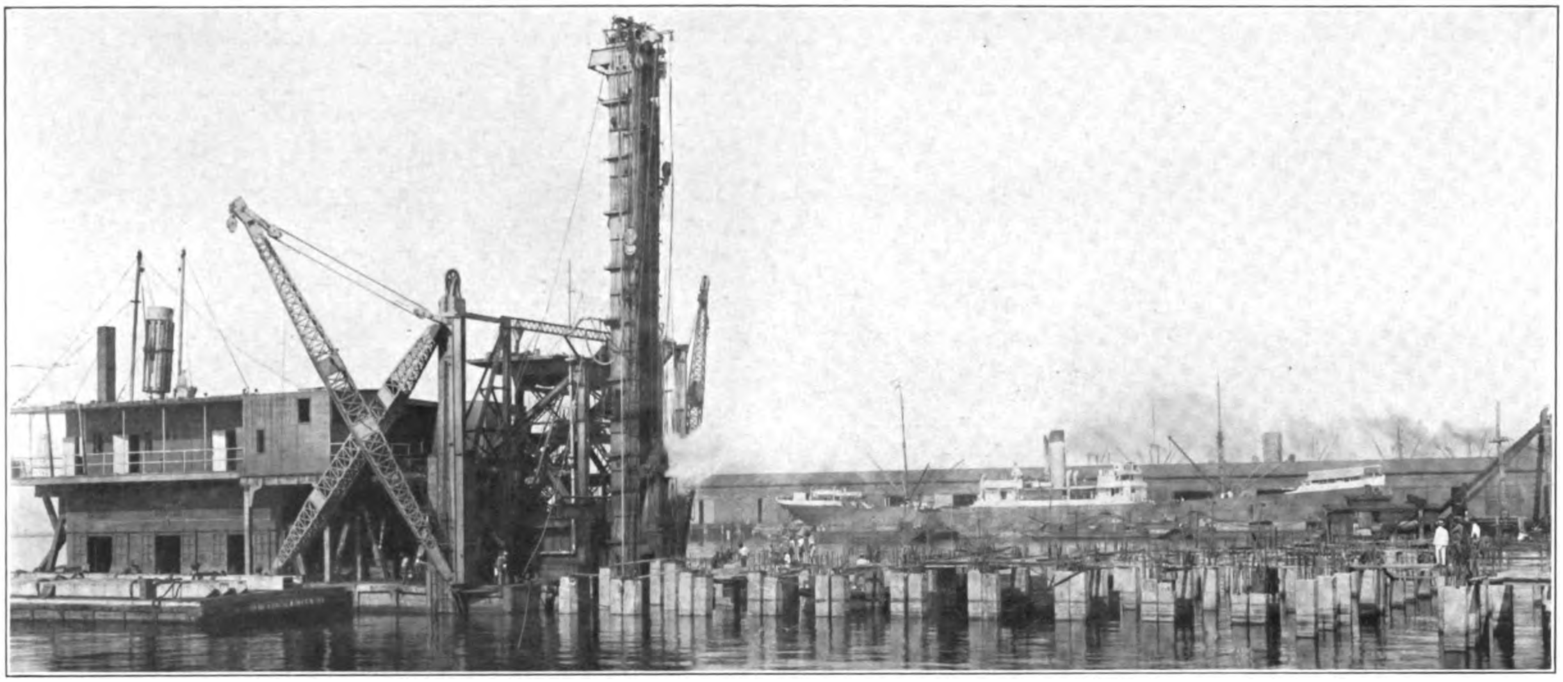
Pier No. 7 is to be in every respect a modern marine terminal of permanent construction, designed to meet all requirements of the largest vessels afloat which make Manila a port of call, such as the *Empress of Canada* and the *Golden State*. These vessels are exceptionally high and have very large cargo capacities which require that the pier, to be of real value and modern in every respect, must be of such dimensions as to properly accommodate them; otherwise the benefits that both shippers and Government will derive from this new structure will be greatly impaired.

As planned, the pier is to be 1,400 feet long from the pier head street line to the harbor limit line. Its facilities for handling freight and dispatching ships will be second to none. When completed and fully equipped, this pier will be the largest and most modern marine terminal in the Orient, capable of berthing four of the largest vessels simultaneously. It will have a freight handling capacity of three times the combined capacities of Piers No. 3 and No. 5.

Very gratifying progress has been made in the construction of the pier, although the work accomplished has not been of a spectacular nature. Since driving operations started, a considerable period of time has been required for sub-aqueous work, due to the fact that in years past enormous quantities of ten- and fifteen-ton rocks have been more or less indiscriminately strewn, for shore protection on the pier site in the vicinity of the pier head; the piles for the latter, of necessity, having to be driven first. Many of the rocks were imbedded in many instances solid to a depth of fifteen to twenty feet under the harbor bottom, and involved considerable time and a great deal of work in removing them before piles could be driven in their proper locations. Early attempts proved that it was not feasible to clear the rocks away for any appreciable time in advance of driving operations as those superimposed on the slope above would roll, under wave action, into the pile areas cleared. On the other hand, to have entirely cleared the site of all rocks, would have entailed prohibitive expenditures and, furthermore, would have caused the loss of the existing seawall which retains the port area fill. If the necessary funds are made available at once from the proceeds of the Port Works Bond Issue, it will be possible for the Bureau to commission one-half of the new pier—in other words, a structure more than twice the size of Pier No. 5—in less than one year from date, and the entire structure can be commissioned within a year and a half. On the other hand, if delays ensue in providing the necessary funds, a corresponding degree of delay must occur in the completion of the project. Approximately 91 per cent of all the necessary steel pile units have been fabricated and about 62 per cent of the necessary concrete piles cast. All of the necessary steel



Pier No. 7 under construction, Manila, P. I.



Pier No. 7 under construction, B. P. W. Pile Driver "Mammoth" driving 110-foot concrete foundation piles, Manila, P. I.

for the pile units and about 70 per cent of reinforcing steel for the deck has been delivered to date. Delivery of the steel roof trusses, steel sash, and steel rolling doors, is expected to be made in August 1922.

Studies and reports were made on the feasibility of dredging the lower reaches of the Iloilo River to greater depths than those proposed on dredging plans previously approved. A considerable amount of data was obtained and compiled for the information of the Wood–Forbes Mission, relative to the magnitude, type, depths of anchorages, etc., pertinent to ports and port structures throughout the Archipelago.

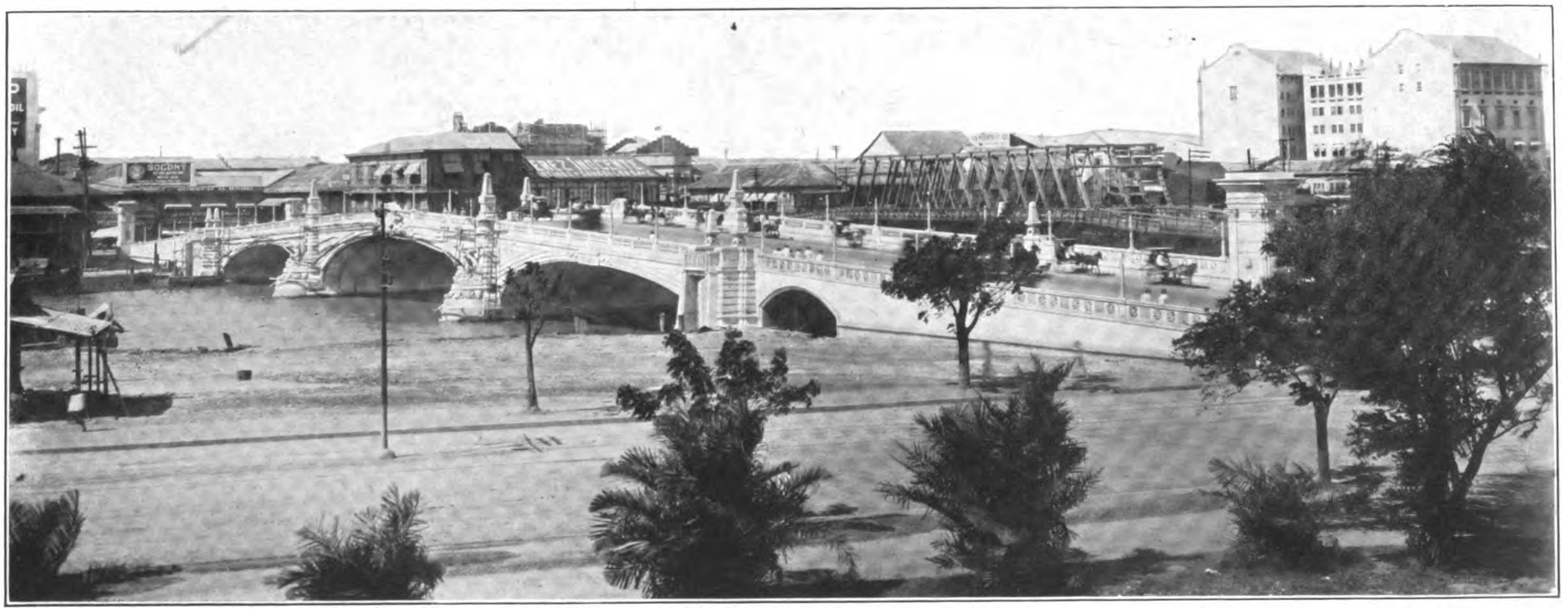
A complete inspection was made of the Cold Dredge belonging to the Mambulao Dredging Company, in dry-dock at Cavite, to ascertain its suitability for conversion into a dredge to meet the Bureau's requirements. It was found, however, that the dredge was entirely unserviceable for bureau use.

The William A. Jones Memorial Bridge, over the Pasig River, the construction of which was supervised by the Designing Division, was thrown open to vehicle traffic August 22, 1921, and was practically completed in November 1921, and fully commissioned in December 1921.

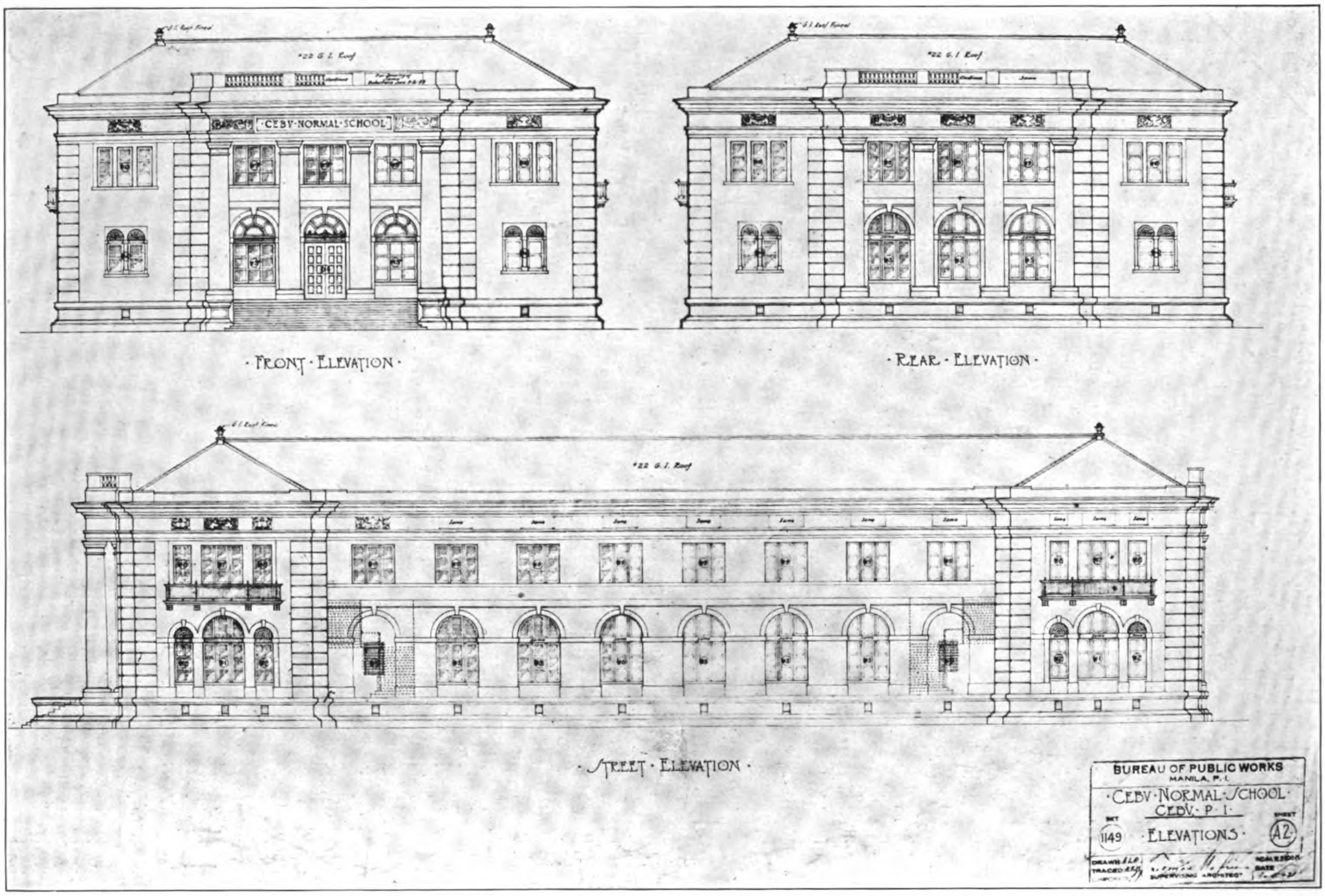
DIVISION OF ARCHITECTURE

TOMAS MAPUA and JUAN ARELLANO, *Supervising Architects*

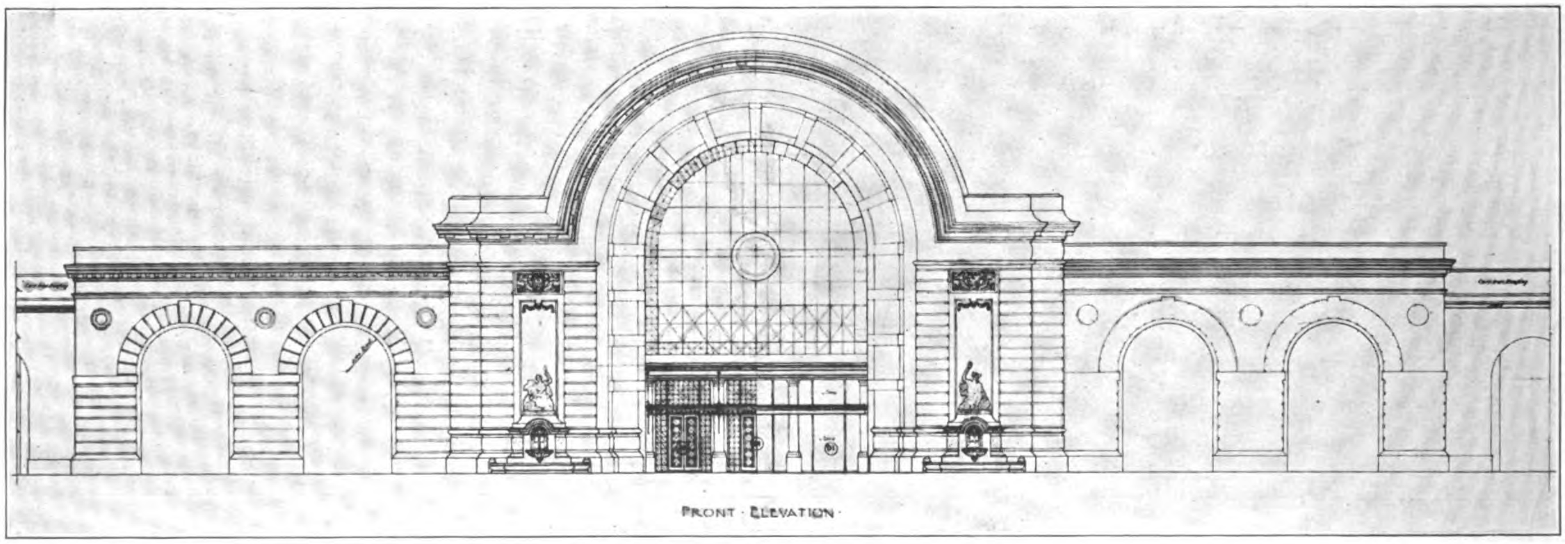
The volume of work accomplished by this Division is best indicated in the following tabulation of projects assigned to Messrs. Mapua and Arellano, respectively.



The William A. Jones Memorial Bridge, Manila, P. I.



Cebu Normal School, Cebu, P. I.



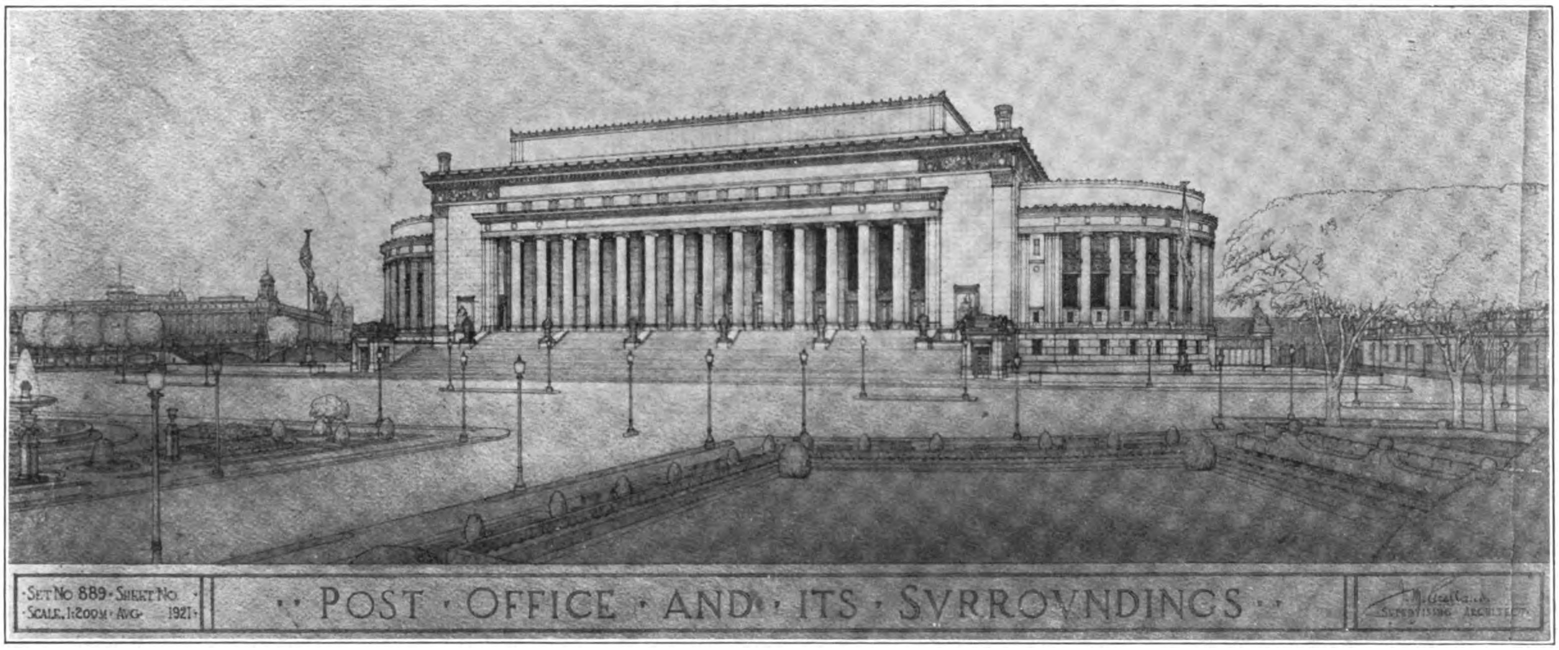
Pier Head No. 7, Port District, Manila, P. I.

PROJECTS ASSIGNED TO MR. MAPUA SHOWING STATUS OF EACH

Manila projects.	Status.
1. Pier Head	Plans are nearing completion.
2. Manila Custom House	Working drawings being revised and completed.
3. Santa Lucia Hospital, Philippine Constabulary	Sketches have been prepared.
4. Insane Asylum	Estimate of cost has been prepared.
5. Training Building, Philippine Normal School	Sketches have been prepared and submitted.
6. Foundry Shop, Engineer Island	Drawings completed.
7. Semaphore Tower	Drawings for a temporary addition to present tower have been prepared.
Provincial projects.	
1. Cebu Normal School	Working drawings completed. A new and more economical type of normal school.
2. Laoag Girls' Dormitory	Sketches have been prepared.
3. Municipal Building, Sibonga, Cebu	Working drawings prepared.
4. Municipal Building, Dingle, Iloilo	Do.
5. Court Building, Tarlac, Tarlac	Sketches have been prepared
6. Layout Cebu Hospital	Do.
7. Capitol Building, Catbalogan, Samar	Sketches have been prepared for a more economical type of capitol building.
8. Malbog Bath House, Marinduque	Sketches have been prepared.
9. Fountain, Lucban Waterworks, Tayabas	Drawing for a tablet has been prepared.
10. Municipal Building, Piddig, Ilocos Norte	Working drawings have been prepared.
11. Municipal Building, Kiangan, Mountain Province	Do.
12. Municipal Building, Irosin, Sorsogon	Do.
13. Municipal Building, San Remigio, Antique	Do.
14. Normal School, Bayambang, Pangasinan	Location plan prepared.
15. Municipal Building, San Jose, Nueva Ecija	Working drawings prepared.

PROJECTS ASSIGNED TO MR. ARELLANO SHOWING STATUS OF EACH

Manila projects.	Status.
1. Insular Government Building	Full size details in preparation.
2. Post Office Building	Do.
3. Layout, Dewey Memorial	Preliminary plans completed.
4. Andres Bonifacio Monument	Plans in preparation.
5. W. A. Jones Monument, Virginia	Alternative design prepared.
6. F. Baltazar Monument	Do.
7. Oil Bodega, Bureau of Printing	Plans completed.
Provincial projects.	
1. Capiz Electric Lamp Post	Plans completed.
2. Layout Provincial Grounds, Malolos, Bulacan	Do.
3. Development and layout of municipal squares and streets, Naga, Camarines Sur	Do.
4. Boundary Monument, Bulacan–Pampanga	Preliminary plans completed.
5. Magazine for blasting caps, Talim Island	Plans completed.
6. Layout of school grounds, Caridad, Cavite	Do.
7. Municipal Building, Alitagtag, Batangas	Do.
8. Fountain Placer Waterworks, Surigao	Preliminary plans completed.
9. Memorial Plate "Tomas Claudio School," Morong, Rizal	Plans completed.
10. Rizal Monument, Ibajay, Capiz	Do.
11. Rizal Monument, Naga, Camarines Sur	Do.
12. Rizal Monument, Libmanan, Camarines Sur	Do.
13. Rizal Monument, Sorsogon, Sorsogon	Do.
14. Plaza Rizal, Libmanan, Camarines Sur	Do.
15. Bandstand, Naga, Camarines Sur	Do.
16. Tower for new Catholic Church, Baguio, Benguet	Sketches prepared.
17. Central School, Baguio, Benguet	Plans in preparation.
18. Cemetery Layout, Cebu, Cebu	Do.
19. Reconstruction, Binmaley School, Pangasinan	Plans completed.
20. Court House and Prison, Malolos, Bulacan	Do.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SUPERVISING ARCHITECT

Architects' Perspective. Post Office Building for Manila and proposed development of the vicinity, Manila, P. I.

During the year there have been many requests for plans for monuments to be erected in various municipalities of the Islands. In designing these monuments great emphasis was given to the proper development and improvement of the proposed site as well as its surroundings. As examples of work carried out successfully under this policy the plaza "Trece Mártires" and the plaza "Rizal" in the municipality of Naga, Camarines Sur, may be mentioned. The construction of these squares has greatly improved the town and has been to the general satisfaction of its inhabitants.

IRRIGATION DIVISION

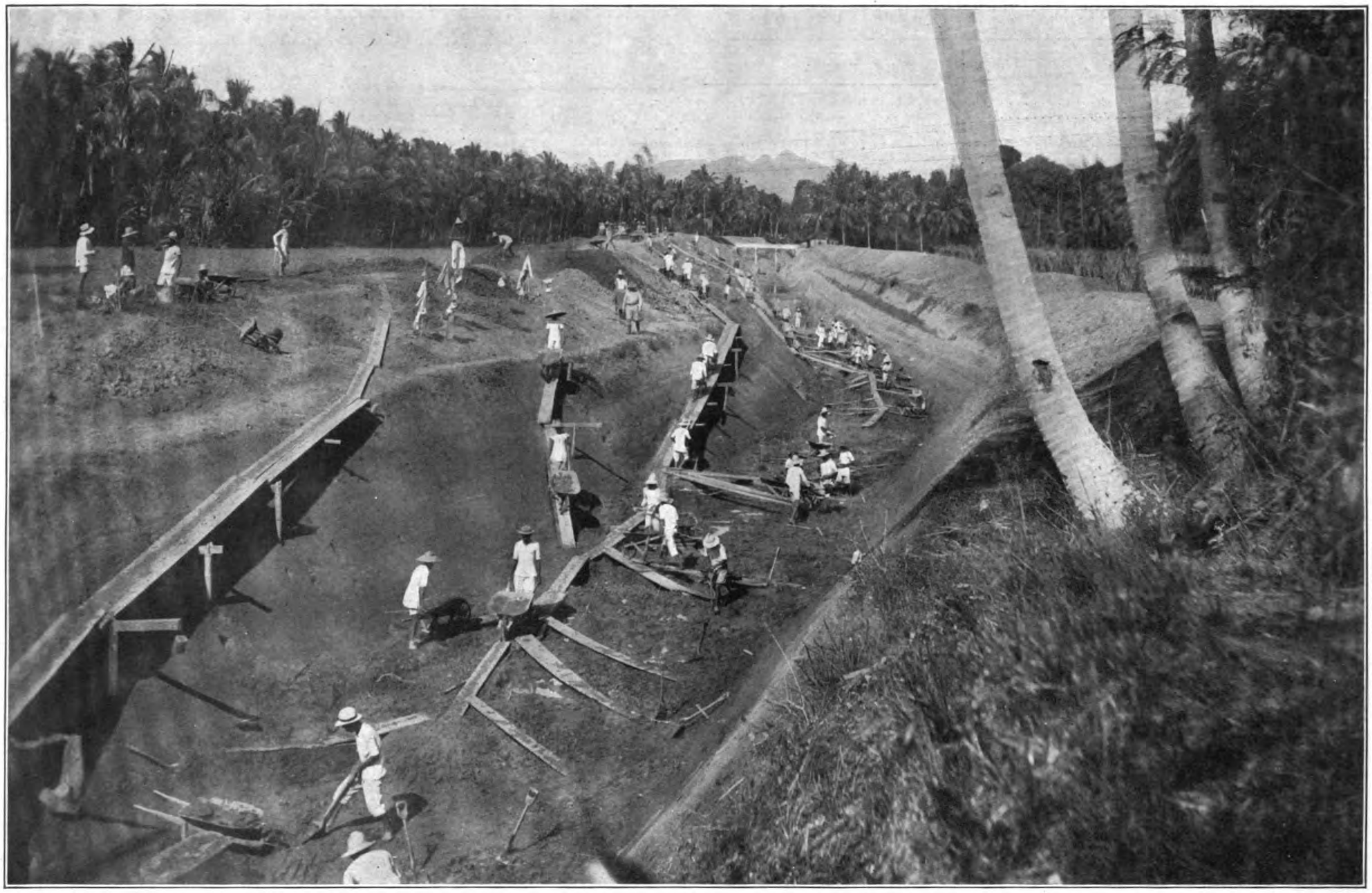
A. D. WILLIAMS, *Chief Irrigation Engineer*

INSULAR IRRIGATION PROJECTS

Construction work during 1921 was confined to projects approved for construction during previous years. Satisfactory progress was made on most of the projects under way until the Government's economy policy was put into effect during the month of August. This policy necessitated discontinuing or reducing expenditures on work that was being performed by administration, but did not affect work that was being accomplished under contract on six of the larger projects. The status of all Insular irrigation projects on which construction work has been authorized is given in the following table:

Project.	Province.	Irrigable area.	Estimated cost.	Allotments authorized.	Remarks.
		Hectares.			*Per cent completed*
Trinidad	Mountain	200	₱40,000.00	₱40,000.00	100
Santa Barbara	Iloilo	4,500	630,000.00	596,000.00	92
Baruyen River	Ilocos Norte	1,200	80,000.00	56,000.00	60
Dingras River	do.	1,200	126,000.00	106,000.00	85
Tagudin	Ilocos Sur	1,300	200,000.00	110,000.00	30
Amburayan River	La Union	4,500	642,000.00	269,000.00	25
Talavera River	Nueva Ecija	10,000	1,028,000.00	650,000.00	30
Angat River	Bulacan	25,000	4,500,000.00	850,000.00	4
Aganao River	Iloilo	5,500	900,000.00	300,000.00	4
Naic	Cavite	800	275,000.00	250,000.00	40
Laoag-Vintar	Ilocos Norte	6,000	1,000,000.00	(300,000.00)	([a])
Lamao	Bataan	160	25,000.00	5,000.00	5
Total		60,360	9,536,000.00	3,232,000.00	

[a] Funds reverted to Insular Treasury.



Main Canal under construction, Santa Barbara Irrigation System, Iloilo, P. I.

Trinidad Irrigation Project.—This project was completed in January 1921, at a cost of ₱40,000. The work involved the construction of a drainage canal approximately two kilometers long; the lowering of the Trinidad River bed about two meters, in the rock gorge immediately below the valley, to drain some 80 hectares of swamp land included in the Trinidad Farm School Reservation and the improvement and extension of an old irrigation system from the Trinidad River to irrigate practically the entire valley. The irrigation system commands an area of approximately 250 hectares, a large part of which is owned by the Trinidad Farm School. A small portion of the reclaimed land has been placed under cultivation and is producing excellent vegetables including Irish potatoes. Most of the land is devoted to growing garden truck for the Baguio and Manila markets and it is claimed by local authorities that the value of such products last year was several times greater than the cost of the project.

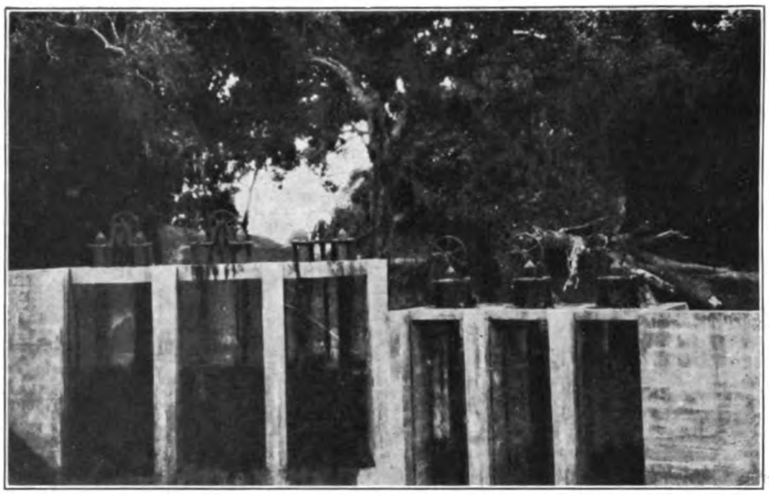
The irrigation system, upon completion by the District Engineer, was turned over to the Superintendent of the Trinidad Farm School for operation and maintenance, in accordance with special authority granted by the Secretary of Commerce and Communications in approving the project for construction. Water is being delivered to private land owners under the system in conformity with the temporary list of appropriations according to priority, prepared by this Division during the early part of the year.

Santa Barbara Irrigation Project.—The completion of this project has been delayed to possibly March 15, 1922, due to the failure of the excavation contractor to complete the work on contract time. An extension of time had been granted him to December 31, 1921, amounting to over 90 per cent of the original contract time, and a further extension of time was denied by the Secretary of Commerce and Communications upon the recommendation of this Bureau. Under the terms of the contract the contractor is required to pay the Government ₱50 per day, as liquidated damages, for each day of delay.

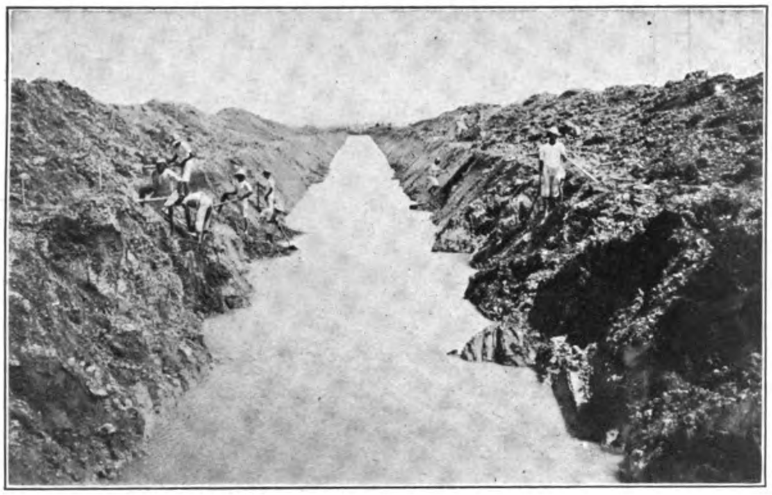
The diversion weir in the Santa Barbara River and all canal structures for the system were completed by the Atlantic Gulf & Pacific Co., contractors for this part of the work, on October 31, 1921. The work was carried out in a very satisfactory manner in spite of the fact that it was extended well into the rainy season. The weir withstood a rather high flood about 10 days after completion without suffering any appreciable damage.

Baruyen River Irrigation Project.—The excavation of the main canal, the most difficult part of the work, was practically completed by administration when construction work was discontinued in August. The work was resumed in January 1922, and if the additional funds required are made available the system should be completed by July 1, 1922, or in time for the next irrigating season.

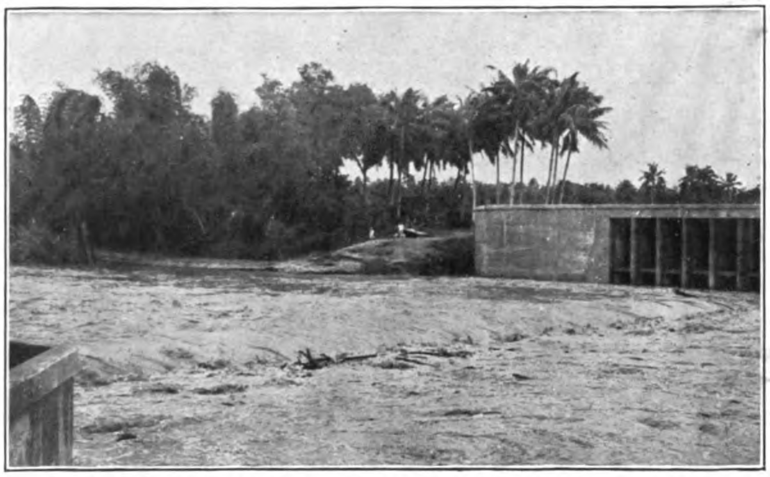
Dingras Irrigation Project.—Construction work on this project, which is being accomplished by administration, was reduced in August to completing structures under way and the maintenance of completed canals. Water was supplied thru the completed main canal to several hundred hectares of land during the rice growing season. Work has been resumed and, with the additional funds needed, the system can be completed in time for the next rice planting season.



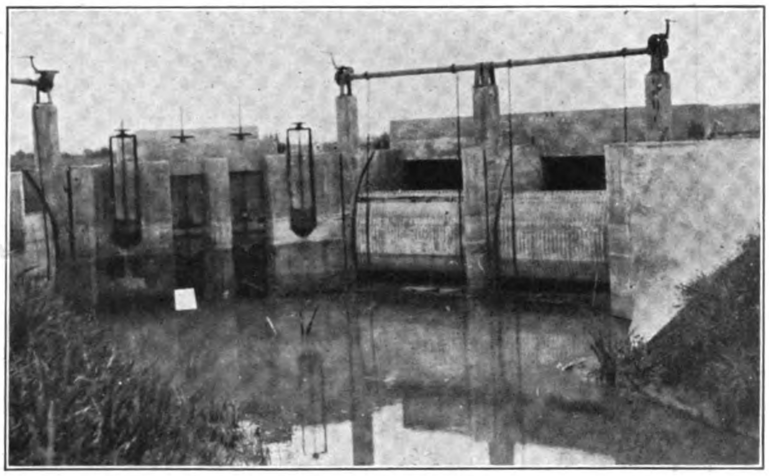
Lateral Headgates, Santa Barbara Irrigation System, Iloilo, P. I.



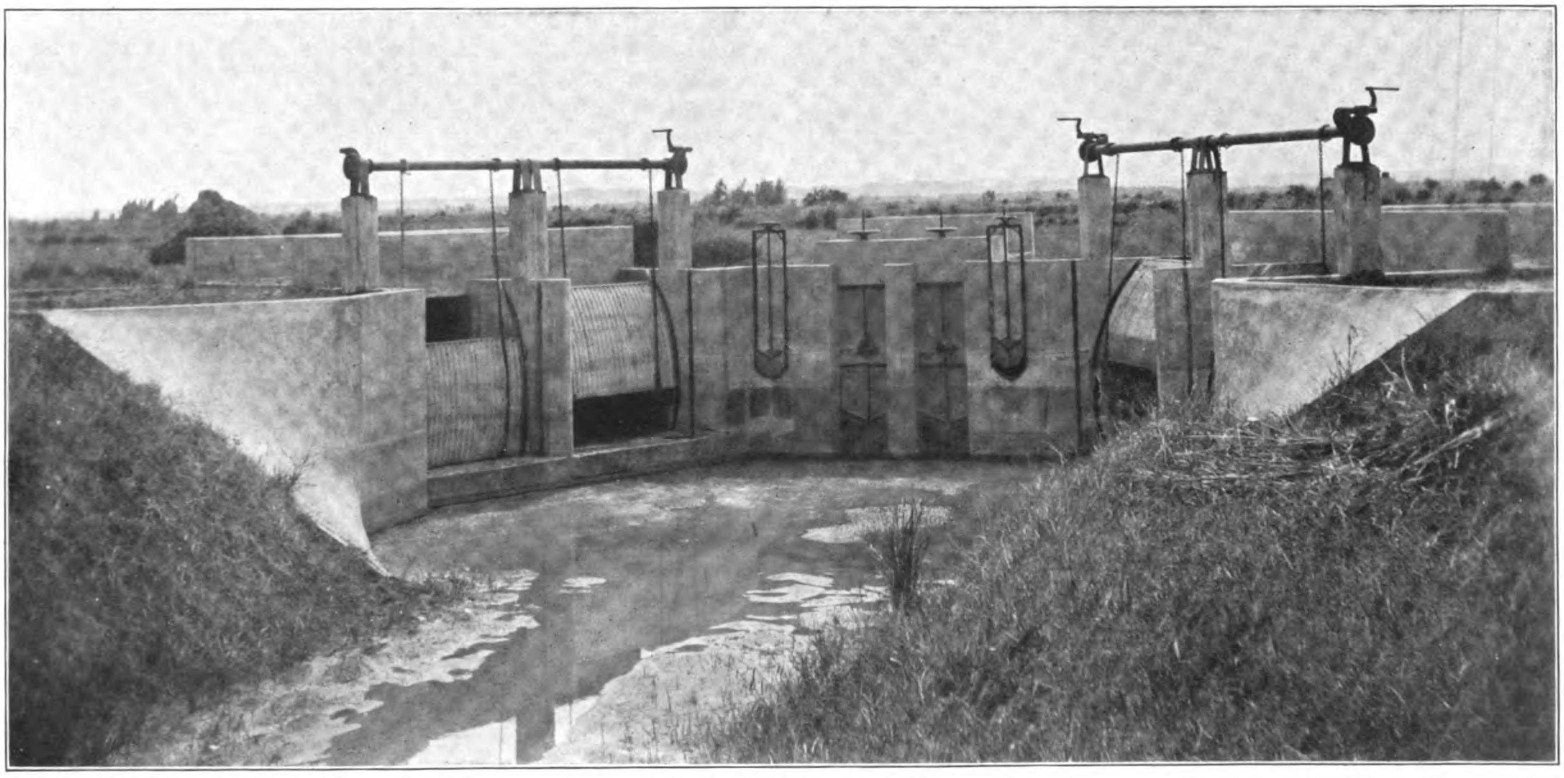
Section of Main Canal, Santa Barbara Irrrigation System, Iloilo, P. I.



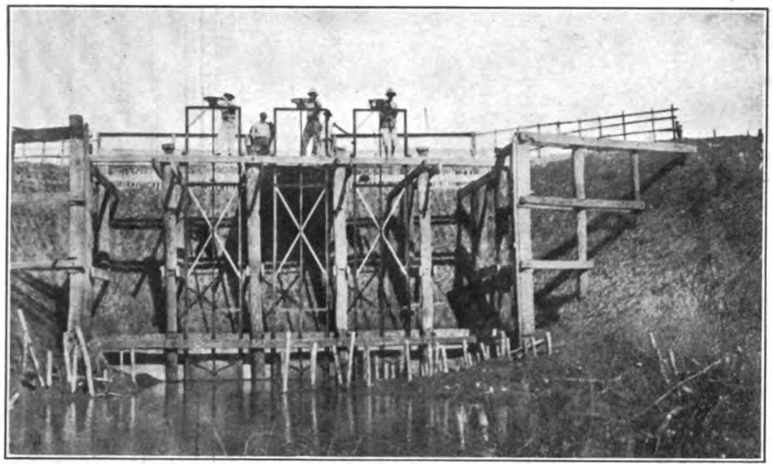
Diversion Works, Santa Barbara Irrigation System, Iloilo, P. I., showing the Tigum River in moderate flood



Trifurcation Structure, Santa Barbara Irrigation System, Iloilo, P. I.



Gates at Trifurcation of Main Canal, Santa Barbara Irrigation System, Iloilo, P. I.



Headworks, Dingras Irrigation System, Ilocos Norte, P. I.

Tagudin Irrigation Project.—The original allotment of ₱100,000 for this project was exhausted in August and work discontinued until December when an additional allotment of ₱10,000 was released for lining a section of tunnel in unstable ground. The driving of the tunnel, approximately 1,300 meters long, will require at least another year under the most favorable conditions. Contrary to expectations, it has been necessary to timber most of the *four hundred meters* of completed tunnel and to place heavy concrete lining in a large portion of it. The soft rock formation decomposes when exposed to air, which may necessitate lining the entire tunnel. This will materially increase the cost of the project and delay the completion of the work.

Chute at Power House Site (15 m. fall) Main Canal, Talavera River Irrigation System. Power will be supplied to Muñoz Agricultural School and to the towns of San Jose and Muñoz, Nueva Ecija, P. I.

Naic Dam, under construction, Cavite, P. I.

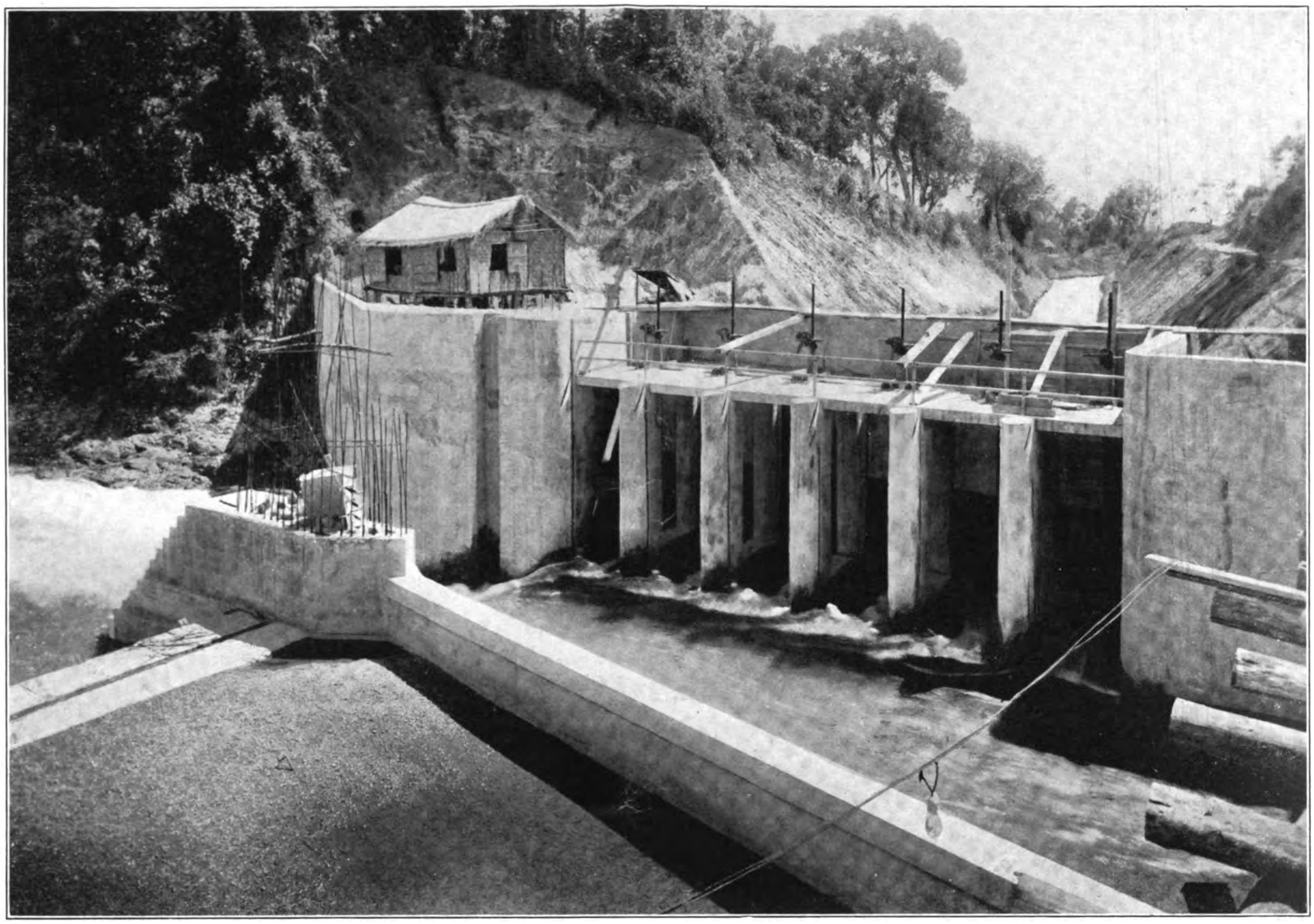
Amburayan River Irrigation Project.—The completed work on this project includes six kilometers of the main canal and about 150 meters of the 750 meters of diversion tunnel. Approximately 5 kilometers of the canal excavation work was accomplished by *paquiao* contractors and about one kilometer, which is in heavy cut, with a Drag Line Excavator. Considerable difficulty was experienced during the past rainy season in maintaining the section of the main canal in heavy cut, due to the sandy formation, and it is now apparent that it will be necessary to line the first 2.5 kilometers which will increase the cost of the project from 20 to 30 per cent. The tunnel work is being performed by administration, using air drills. It is expected to complete the work on this project in 1922.

Talavera River Irrigation Project.—The excavation of the main canal, 12 kilometers long, was completed by the contractor, Mr. Sotero Baluyot, in June 1921. The construction of the diversion weir and all main canal structures is being accomplished under contract with Messrs. Martin and Hanna. This work is progressing in a satisfactory manner and should be completed within the contract time, which expires June 30, 1922. If funds could have been provided for rushing the work of excavating the lateral canals during 1921, the system could have been completed in June 1922. It is now planned to complete construction work in June 1923.

Angat River Irrigation Project.—The Atlantic Gulf and Pacific Co., contractors for the excavation of the south side canal system, made fairly satisfactory progress during 1921. Three Drag Line Excavators have recently been received by the contractors and placed in use for excavating the main canal. The smaller canals are being built by subcontractors and it is expected that much better progress will be made on this work in 1922. Proposals were requested in December for the construction of diversion works in the Angat River and the awarding of a contract to the successful bidder, whose bid is a very satisfactory one, is pending the appropriation of funds. The specifications require the diversion works to be completed in June 1923, which would allow the south side system to be opened for the rice crop of 1923. If funds are provided to carry out construction plans, the project can be completed in 1924.

Aganao River Irrigation Project.—The work on this project was confined to the excavation of the canal system, which is being performed under contract with the Manila Engineering Co. The contractor's delay in starting the work, thereby losing most of the dry season, is responsible for the slow progress. The contract stipulates that this work must be finished early in July 1922. Proposals were requested for the construction of the diversion works for this project in December and the acceptance of the most satisfactory bid is pending the appropriation of funds. Construction plans now contemplate finishing this project in 1923.

Naic Irrigation Project.—The Manila Engineering Co., contractors for the construction of the masonry diversion dam and canal system,



Diversion Works under construction, Talavera River Irrigation System, Nueva Ecija, P. I.

have made unsatisfactory progress and will be unable to complete the work by February 1, 1922, the expiration of the extension of time granted them. Delay by the contractors in starting the work and their lack of organization have been largely responsible for the showing made. Difficulties encountered in excavating for the foundation of the dam and the lack of labor have also interfered with the progress of the work. This system should be completed and opened in time for the next rice planting season.

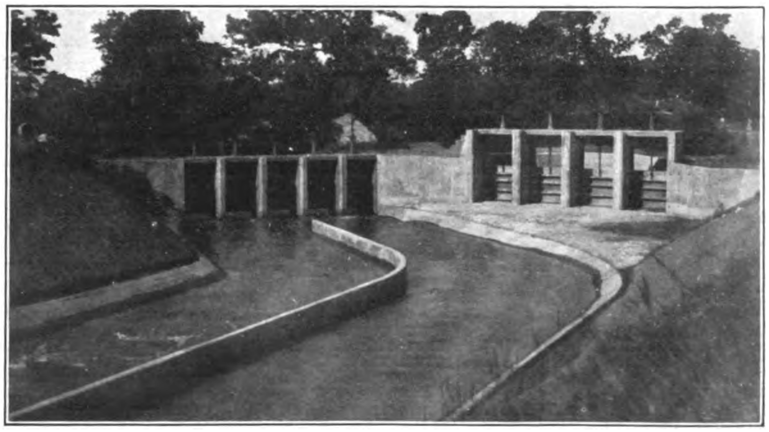
Laoag-Vintar Irrigation Project.—Shortly after the protest against this project was decided upon and construction authorized, the funds allotted for construction purposes were reverted to the Insular Treasury by the Emergency Board. The starting of construction work is therefore pending the appropriation of funds. Borings at the dam site and other preliminary investigations have been made preparatory to starting the work.

Lamao Experiment Station Irrigation Project.—Only a small amount of work had been accomplished on this project by administration when ₱25,000 of the ₱30,000 allotted were reverted by the Emergency Board to the Insular Treasury. The construction of this project should be resumed as soon as additional funds can be provided.

MUNICIPAL IRRIGATION PROJECTS

Work on the Ayala and Dipolog projects in Zamboanga Province was discontinued early in the year due to funds having been exhausted. The Ayala system is about 80 per cent complete and was utilized for this year's rice crop. The headworks and main canal of the Dipolog system are practically finished, but considerable work remains to be done before the system can be put into operation. The municipalities of Zamboanga and Dipolog hope to finance their share of the cost of completing these projects in 1922 and additional Insular allotments have been recommended.

The Santa Maria irrigation system in Zamboanga was completed and turned over to the municipality for operation affective January 1, 1921.



View of Settling Basin, Talavera River Irrigation System, Nueva Ecija, P. I., showing sluice gates open and gates at inlet to Siphon under Cabibitnungan Creek closed

Excavating Main Canal, Angat River Irrigation System, Bulacan, P. I., with a Drag Line Excavator

The following municipal irrigation projects recommended for construction in 1920 are still pending due to the inability of the municipalities concerned to finance one-third of the estimated cost of the projects, as required under the provisions of Act No. 2755:

Project.	Province.
Pililla Irrigation	Rizal.
Morong Irrigation	Do.
Balaoan Irrigation	La Union.
San Fabian Irrigation	Pangasinan.
Mangatarem Irrigation	Do.

IRRIGATION PROJECTS UNDER CONSIDERATION

The following list gives the location, irrigable area and status of important irrigation projects under consideration:

Province.	Project.	Irrigable area.	Status.
		Ha.	
Albay	Quinale–Lake Bato	6,000	Awaiting investigation.
Do	Malinao–Tabaco	600	Do.
Camarines Norte	Daet Irrigation Project	2,000	Topographic survey completed.
Do	Talisay–Indan	3,000	Do.
Camarines Sur	Colassi	5,000	Awaiting investigation.
Do	Pauili Valley	5,000	Topographic survey completed.
Do	Barit River	2,000	Awaiting investigation.
Do	Libmanan	15,000	Do.
Do	Naga	6,000	Do.
Antique	Sibalom	3,000	Topographic survey completed.
Bataan	Dinalupijan	2,500	Awaiting investigation.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon Irrigation Project	2,000	Awaiting investigation.
Do	Mambusao	1,000	Preliminary investigation, 1911.
Do	Macato–Malinao	1,200	Do.
Do	Ibahay	500	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Preliminary investigation, 1910.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
Do	Candon	3,000	Topographic survey completed.
Batangas	Batangas	1,000	Investigation in progress.
Do	Balayan	300	Do.
Do	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Topographic survey completed.
Do	Pototan	2,300	Survey and preliminary design made.
Do	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Investigation in progress.
La Union	Balaoan	12,000	Survey and plans completed.
Do	Bacnotan	2,000	Topographic survey completed.
Do	Agoo–Tubao	2,000	Awaiting investigation.
Do	Naguilian	1,000	Do.
Do	Rosario	1,000	Topographic survey completed.
Do	San Juan	1,000	Awaiting investigation.
Leyte	Barugo Irrigation System	1,000	Topographic survey completed.
Do	Dagami–Tanauan	14,000	Awaiting investigation.
Do	Dato–Hilongos	3,500	Do.
Nueva Ecija	Pampanga River	20,000	Topographic survey practically completed.
Do	Peñaranda	15,000	Topographic survey completed.
Nueva Vizcaya	Murong	1,200	Do.
Occidental Negros	Binalbagan–Himamaylan	3,000	Do.
Do	Bago	20,000	Investigation in progress.
Do	Silay Irrigation Project	5,000	Awaiting investigation.
Oriental Negros	La Granja Experiment Station	200	Investigation in progress.
Do	Tanjay Irrigation Project	800	Awaiting investigation.
Do	Tolong	3,000	Do.
Pampanga	Porac River	1,000	Do.
Do	Bamban	3,000	Do.
Do	Gumain	5,000	Do.
Pangasinan	Agno	30,000	Topographic survey made, 1910.
Do.	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do	San Fabian	4,000	Do.
Rizal	Mariquina Valley	5,000	Topographic survey completed.
Do	Pililla	180	Recommended for construction, Act 2755.
Do	Morong	580	Do.
Tarlac	Capaz	5,000	Topographic survey completed.
Do	Tarlac	30,000	Awaiting investigation.
Zambales	San Marcelino	5,000	Topographic survey completed.
Do	Toton–Lanom	600	Do.
Do.	Iba	400	Do.

Topographic surveys were completed during 1921 of the Rosario, Peñaranda, Morong, Binalbagan–Himamaylan and Daet–Talisay–Indan projects covering a total area of 25,300 hectares. This makes 25 projects which have been surveyed and are now ready for construction. These projects embrace a total area of approximately 140,000 hectares while projects under or awaiting investigation cover an additional area of about 200,000 hectares. Investigations were in progress at the end of the year, with surveying parties in the field, on the Pauili River, Pampanga River, Santa Cruz River, Agno River and Bago River irrigation projects.

A FIVE-YEAR PROGRAM FOR IRRIGATION

A five-year program for the construction of Insular irrigation projects was prepared by the Division for submission to the Legislature in connection with the proposed appropriation of funds (₱20,000,000), derived from the sale of Government bonds, Act 2940, for the construction of irrrigation systems. It was recommended that approximately ₱6,300,000 be invested in completing irrigation projects under construction (but incompletely financed) and that the balance of the proposed appropriation be used for constructing the more important projects under consideration for which preliminary data are available. The completion of the projects included in this program would bring under irrigation an additional area of approximately 160,000 hectares and it is estimated that this would serve to increase the annual rice production of the Islands by about 3,000,000 cavanes (172,500,000 kilos) which is the average shortage for the past 22 years.

MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS

The San Miguel irrigation system in Tarlac Province was maintained and operated under the supervision of the Division at a cost of ₱26,400.87. The Pilar system was maintained by the District Engineer of Bataan and a continuous supply of water delivered to land owners under the system.

General regulations drafted by the Division and approved by the Honorable, the Secretary of Commerce and Communications for the operation and maintenance of Insular irrigation systems were put into effect in November 1921.

HYDROGRAPHIC INVESTIGATION

There were being maintained at the end of the year 184 permanent gaging stations, 34 stations having been established during the year and 14 old stations abandoned. Daily gage height records were kept at all of these stations and frequent current meter measurements made by hydrographers of the Division. Measurements were also made at 43 temporary stations on streams and ditches in connection with water right investigations.

WATER RIGHTS

The Division received during the year 168 new applications for water rights, 134 of which were for irrigation and 34 for power purposes. A total of 145 applications were acted upon, 115 having been granted and 30 disapproved by the Secretary of Commerce and Communications upon the recommendation of the Irrigation Council. The rights granted for irrigation purposes were based on irrigating 15,071 hectares of land. The 16 applications granted for power purposes were based on developing a maximum of 3,083 horse power. There were 8 applications pending action by the Irrigation Council at the end of the year.

Old water rights were determined during the year on 5 streams making the total number of streams so adjudicated to date 18. The adjudications made in 1921 involved 1,713 separate rights or parcels of land and affect the title to water for irrigating 3,559 hectares of land.

Surveys have been completed and maps prepared showing all water right locations on 7 streams. These surveys include 44,800 hectares of irrigated lands. The streams which have been surveyed and are now pending adjudication are given in the following table:

Bank Protection, Intake Side, Diversion Works (view taken from the landward side)
San Miguel Irrigation System, Tarlac, P. I.

Stream.	Province.	No. of diversion ditches.	Length of main canals in meters.	No. of municipality affected.	Approximate number of hectares irrigated.
Baliwag	Nueva Ecija	260	90,000	7	23,000
O'Donnel–Moriones and Tarlac.	Tarlac	2	4,000	4	10,000
Bued	Pangasinan, La Union, and Mountain Province	193	30,300	6	5,500
Ange and Gogo	Pampanga	25	970	4	5,200
Nagsincaoan and Ubbog	Ilocos Sur	52	8,200	1	1,000
Total					44,800

Surveys are in progress with surveying parties in the field on the following streams:

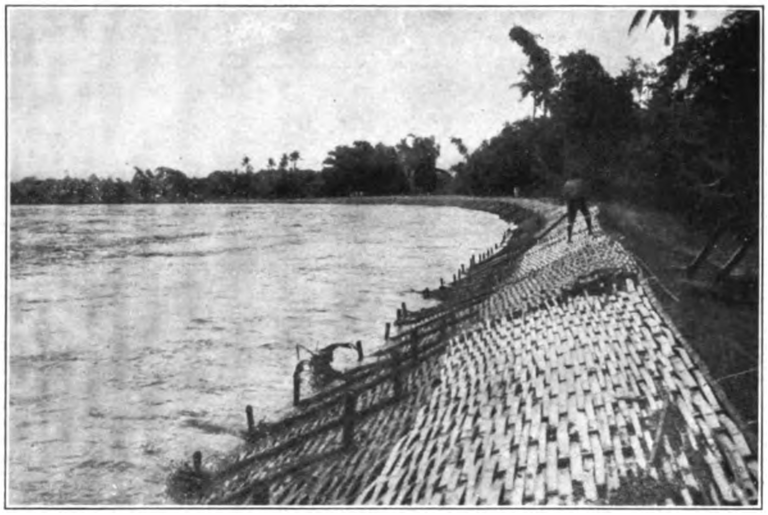
Stream.	Province.	Municipality affected.	Approximate area of land irrigated in hectares.
San Jose, Anayan, and Pauili Rivers.	Camarines Sur	Pili and Bula	4,000
Banila	Pangasinan	Rosales, Baluñgao, Umingan and Santa Maria.	2,000
Andulan	do	do	1,000
Total			7,000

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream.	Province.	Munic'pality affected.	Approximate area of land irrigated in hectares.
Nasisi	Albay	Ligao and Oas	1,000
Ynarihan	Camarines Norte	Naga, Maganao and Calabanga	1,200
Maoguingoguing	Ilocos Norte	Vintar	500
Balingasay	do	Sarrat	300
Lubnac	Ilocos Norte	Vintar	300
Parasapas	Pangasinan	Tayug and Natividad	300
Malabago or Anondaan River.	do	Calasiao, San Carlos, Malasiqui and Santa Barbara.	1,000
Gogo and Buge	Tarlac	Concepcion	1,000
Porac	Pampanga	Lubao, Florida Blanca, Porac and Guagua.	3,200
Gumain	do	Lubao, Florida Blanca	1,200
Caulaman	Pampanga and Bataan.	Lubao, Dinalupihan and Hermosa	300
Burnay	Ilocos Norte	Solsona and Dingras	1,500
Total			11,800

RIVER CONTROL PROJECTS

Plans were prepared by the Division for six river control projects in the Provinces of Pangasinan, Tarlac, La Union, Laguna, Albay and Cebu. Several of these projects are under construction by District Engineers. Mr. C. G. Wrentmore, a Consulting Engineer, who was engaged under contract in 1920 to investigate and report upon the flood control of the Agno, Tarlac and Pampanga Rivers, submitted complete reports with plans and estimates for proposed works on the Agno River and Talavera or Chico River, a tributary of the Pampanga River. A preliminary report was also submitted on the section of the Pampanga River which had been surveyed.



Tarlac Dike Revetment and Tarlac River in flood, Tarlac, P. I.

Surveys are now in progress on the Tarlac River and, under the terms of Mr. Wrentmore's contract, a final report must be submitted for this river and the Pampanga River by June 30, 1922.

HYDRO-ELECTRIC PROJECTS

A preliminary investigation and survey were made at the request of the National Development Co., to determine power possibilities on the Agno River from the mouth of the Itogon River, in Benguet Province, to the mouth of the Agno Gorge in Pangasinan Province. Measured along the river, this is a distance of over forty kilometers. For the greater part of this distance the river is in a box canyon which in many places was inaccessible until a foot trail was constructed for making the survey. The survey showed that there is a total head of 411 meters (1,346 feet) available and that it would be feasible to utilize this head at four plants for developing 112,000 horse-power. A report with preliminary plans and estimates was prepared for submission to the National Development Co. Preliminary plans were also prepared in conjunction with the Electrical Engineer of the Bureau of a proposed hydro-electric plant to be constructed at the 15-meter fall on the main canal of the Talavera River irrigation system. This plant is to have a capacity of approximately 400 horse-power and would supply power to the Central Luzon Agricultural School and the towns of San Jose and Muñoz, Nueva Ecija Province.

WATERWORKS

Seven new waterworks were started during the year and 27 systems on which work was commenced in 1918, 1919 and 1920 are being finished. To date 89 systems have been completed in the Islands, 13 of which were completed in 1921. There are 76 new systems in 29 provinces proposed for construction which will be financed as rapidly as the Legislature provides funds and the municipalities have appropriated their share.

Waterwork projects completed to date furnish potable water to a total population of 286,980 and have cost ₱2,728,304.28 while projects under construction will supply a population of 100,797 at an estimated cost of ₱1,764,879. The 76 proposed systems contemplate supplying potable water to 322,274 people at an estimated cost of ₱5,522,700.

The high prices charged in recent years for pipe, the limited resources of the municipalities concerned and the recent financial crisis, have delayed the financing of several important waterworks projects for which data have been available. So far, no province, municipality, nor chartered city has availed itself of the provisions of Act No. 2894, passed by the Fifth Philippine Legislature, authorizing the issue of bonds under certain conditions to facilitate financing waterworks projects. The Bangued waterworks project in Abra Province and the Santa Cruz and Majayjay projects in Laguna were, however, partially financed by bonds issued under Acts Nos. 2838 and 2773, respectively.

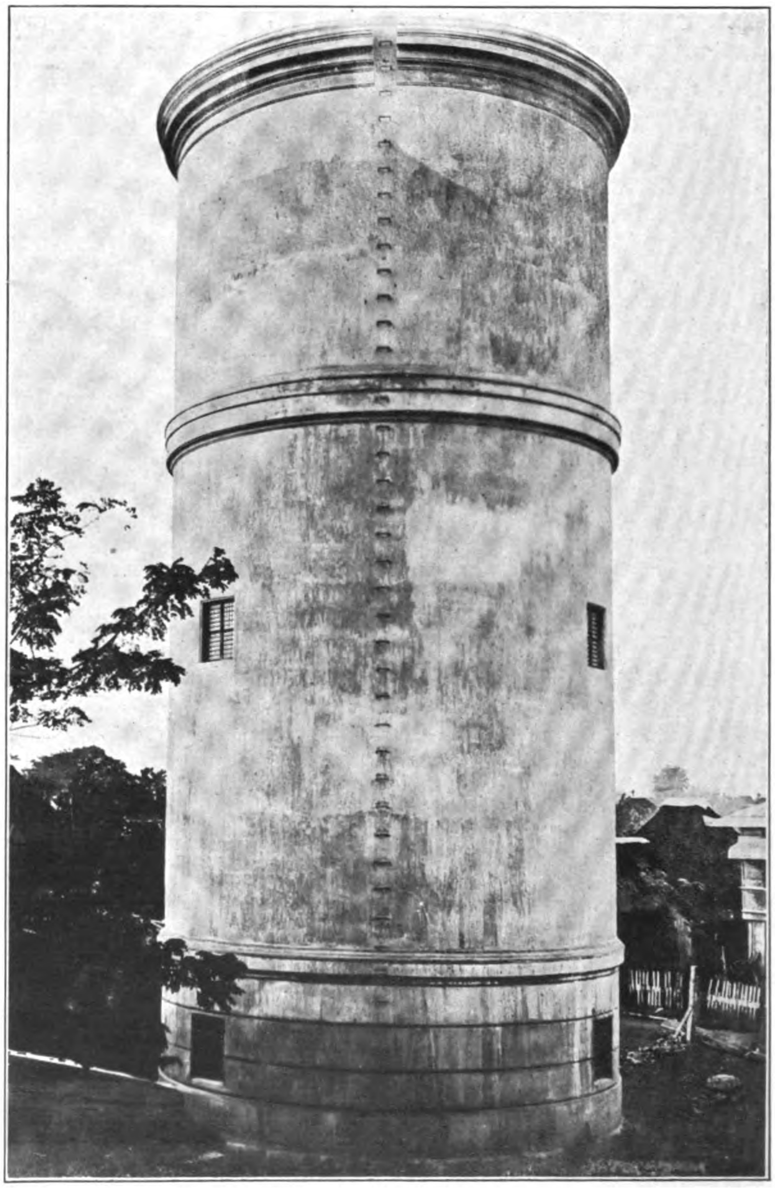
The status of all waterworks projects to date is shown in the following lists:

List (A)—Waterworks projects begun in 1921.
List (B)—Waterworks projects under construction exclusive of List (A).
List (C)—Waterworks projects completed.
List (D)—New waterworks projected.

LIST (A).—*Waterworks projects begun in 1921*

Province.	Municipality.	Type of system.	Population to be served.	Estimated cost.	Insular allotment.	Municipal allotment.
Batangas....	Kalaw or Santo Tomas.	Gravity....	1,910	₱30,000.00	₱15,000.00	₱10,000.00
Do.....	Taal extension (Balisong-Sambat).	Pumping...	4,000	69,000.00	15,000.00	10,000.00
Bohol.......	Loon.........	Gravity....	5,000	47,000.00	10,000.00	11,000.00
Do.....	Mabini.........	.....do.....	1,800	6,600.00	4,400.00	2,200.00
Cebu.......	Sambag (Osmeña Water Works Extension).	Pumping...	([a])	75,000.00	25,000.00	12,500.00
Do.....	Tuburan.....	Gravity....	3,900	85,000.00	....	19,000.00
Laguna.....	Magdalena...	.....do.....	3,000	68,000.00	....	20,000.00
Total.	....	....	19,610	380,600.00	69,400.00	84,700.00

[a] Part of Cebu Waterworks.



Reinforced Concrete Water Tank, 100,000 gallon capacity, Santa Cruz Waterworks, Laguna, P. I.

LIST (B).—*Waterworks projects under construction exclusive of List (A)*

Province.	Municipality.	Type of system.	Population to be served.	Estimated cost.	Insular allotment.	Municipal allotment.
Abra (Ilocos Sur).	Bangued	Gravity	6,600	₱120,000.00	₱50,000.00	₱40,000.00
Antique	San Jose	Pumping	4,000	44,000.00	26,666.67	15,436.59
Batangas	Batangas	do.	6,147	72,123.00	43,600.00	25,500.00
Do	Lemery	do.	7,200	44,000.00	25,000.00	15,411.19
Do	Lipa	do.	5,000	100,000.00	42,842.00	55,000.00
Bulacan	Marilao	Bathhouse		21,000.00	14,000.00	7,000.00
Cavite	Mendez-Nuñez.	Pumping and hydro-electric.	1,600	55,000.00	36,833.33	18,800.00
Cebu	Dalaguete extension.	Pumping	3,500	57,000.00	5,000.00	2,500.00
Do	Opon	do.	1,500	34,000.00	15,000.00	7,500.00
Davao	Davao	Gravity	6,000	150,000.00	105,000.00	31,666.00
Marinduque	Gasan	Pumping	1,400	24,468.00	13,333.33	8,156.00
Do	Malbog	Gravity	1,000	16,000.00	10,000.00	5,000.00
Misamis	Cagayan	Pumping	3,000	50,000.00	32,000.00	16,000.00
Mountain Province.	Apayao (Kabugao).		800	7,000.00	5,000.00	
Do	Baguio	Pumping and gravity.	5,000	130,000.00	75,000.00	47,500.00
Do	Cervantes	Gravity	800	8,000.00	5,667.00	1,350.00
Do	Lubuagan	do.		12,000.00	5,000.00	
Do	Trinidad	do.	1,500	30,000.00	30,000.00	
Nueva Ecija	Cabanatuan	Pumping	6,000	106,000.00	25,000.00	32,500.00
Oriental Negros.	Dumaguete	do.	4,000	84,988.00	38,300.00	17,550.30
Palawan	Bacuit	Gravity	1,000	3,200.00	2,500.00	700.00
Do	Bintuan	do.	1,000	5,500.00	2,500.00	1,000.00
Do	Cuyo	Pumping	800	8,000.00	3,000.00	2,500.00
Pampanga	Arayat	Gravity	3,840	16,000.00	8,800.00	4,400.00
Samar	Catbalogan	do.	2,000	60,000.00	33,000.00	20,000.00
Tayabas	Mauban	Pumping	3,500	51,000.00	34,000.00	17,000.00
Zambales	San Antonio.	Gravity	4,000	75,000.00	25,000.00	([a])
Total			81,187	1,384,279.00	712,042.33	392,470.08

[a] One-third cost guaranteed by Municipal Council and Provincial Board.

LIST (C).—*Waterworks projects completed*

Province.	Municipality.	Population.	Cost.	System.	Remarks.
Albay	U. S. Reservation, Regan Barracks and Albay.	4,500		Crude oil and steam pumping.	Constructed by Military Government 1908; extension and new engine installed 1920.
Batangas	Balayan	2,000	₱7,353.92	Gravity	
Do	Cuenca	2,500	5,000.00	do.	
Do	Lipa [a]	5,000	100,859.17	Pumping	
Do	San Jose [a]	4,000	43,968.12	Gravity	
Do	Taal	5,000	91,176.29	Pumping	
Bohol	Dawis	840	5,031.42	Gravity	
Do	Duero	2,000	10,431.71	do.	
Do	Jagna	3,000	20,042.73	do.	
Do	Loay	2,400	15,308.85	do.	
Do	Tagbilaran	5,245	12,990.35	Pumping	
Do	Tubigon [a]	4,800	34,142.17	do.	
Bukidnon	Deleric	600		Gravity	
Do	Malaybalay [a]	1,300	11,641.16	do.	
Do	San Luis	500	650.00	do.	
Bulacan	Hagonoy	850	6,478.32	do.	
Capiz	Capiz	7,000	12,000.00	Circular concrete tank.	
Cebu	Barili	4,000	28,050.00	Gravity	
Do	Carcar [a]	6,400	75,682.36	do.	
Do	Catmon	1,800	15,357.40	do.	
Do	Dumanjug [a]	2,500	32,700.83	Pumping	
Do	Cebu	40,000	437,757.77	Gravity	
Do	Ginatilan [a]	1,600	14,200.00	do.	
Do	Malabuyok [a]	1,500	14,941,15	do.	
Do	Moalboal	3,000	15,000.00	do.	
Do	Oslob, Barrio Mainit. [a]		2,000.00	do.	

[a] Completed in 1921.

LIST (C).—*Waterworks projects completed*—Continued

Province.	Municipality.	Population.	Cost.	System.	Remarks.
Cebu	Pilar	1,000	₱9,000.00	Gravity	
Do	Poro	800	9,000.00	do.	
Do	Naga	2,000	6,800.00	do.	
Do	Naga extension	2,000	4,500.14	do.	
Do	Samboan	1,600	4,981.02	do.	
Do	San Francisco	1,400	6,200.00	do.	
Do	Sibonga	6,000	35,300.00	do.	₱3,000 spent for tank cover, 1921.
Do	Tudela	800	8,659.90	do.	
Cotabato	Parang	600	9,600.00	Hydraulic ram.	
Ilocos Sur	Vigan	8,440	127,242.58	Gravity	
Isabela	Ilagan Constabulary tank.				
Laguna	Bay	1,471	2,797.21	Gravity	
Do	San Pablo	7,000	84,550.75	do.	
Do	Santa Cruz [a]	6,000	94,078.93	Pumping	
Do	Majayjay	3,200	37,179.85	Gravity	
Do	Nagcarlang	2,500	36,034.42	do.	
Do	Pagsanjan	4,044	73,782.67	Pumping	
Marinduque	Boac	1,000	6,653.00	do.	
Do	Mogpog	1,280	10,535.69	Gravity	
Do	Santa Cruz	2,560	20,696.23	do.	
Mindoro	Abra de Ilog [a]	350	4,743.74	do.	
Do	Calapan	2,500	29,743.47	Pumping	
Misamis	Balingasag	3,284	11,743.18	Gravity	
Do	Mahinog	5,727	6,000.00	do.	
Do	Mambajao	14,446	30,000.00	do.	
Do	Sagay	6,321	800.00	do.	
Mountain	Teacher's Camp and Country Club.	1,500	([b])	do.	
Do	Mansion House	100	([b])	Pumping	
Oriental Negros	Siquijor Poblacion.	587	18,000.00	Gravity	
Do	Barrio Siquijor	494		do.	
Do	Luzuriaga	2,500	12,326.39	do.	
Do	Talinting	2,890	5,025.00	do.	
Do	Basac	265		Hydraulic ram.	
Do	Maria	1,121		Gravity	
Do	Lazi	2,300	6,980.77	do.	
Palawan	Puerto Princesa	1,600	25,000.00	Pumping	
Do	Coron	1,000	7,765.49	do.	
Pampanga	Angeles	6,708	12,318.52	Steam pumping.	
Do	San Fernando	1,000	1,050.02	Pumping	
Pangasinan	Bani	2,000	12,022.27	Gravity	
Do	Bayambang	1,500	3,480.62	do.	
Do	Dagupan	Market.	2,823.02	do.	
Do	Lingayen	Market.	3,938.99	do.	
Do	Lingayen	School.	9,141.22	do.	
Do	Mangaldan	Market.	635.53	do.	
Do	San Fabian	Market.	682.87	do.	
Rizal	Antipolo	2,250	23,299.07	Pumping	
Do	Pasig	10,000	40,000.00	do.	
Romblon	Romblon	2,300		Gravity	Originally built in 1864. Reconstructed, 1900, by Military Government.
Samar	Oras	4,000		do.	Constructed by Military.
Sorsogon	Bacon [a]	3,200	21,000.00	do.	
Do	Magallanes	3,500	8,000.00	Pumping and gravity.	
Do	Sorsogon	250	1,044.67	Pumping	Municipal building.
Sulu	Jolo	722	76,974.29	do.	
Surigao	Barrio Bacuag, Gigaquit.	5,000	7,500.00	Gravity	
Do	Lianga	2,032	1,924.58	do.	
Do	Placer	1,200	13,203.06	do.	
Tayabas	Lucban	3,200	49,511.60	do.	
Do	Lucena	7,500	234,390.57	do.	
Do	Sariaya	6,000	37,935.00	do.	
Do	Tayabas	4,600	125,159.36	do.	
Zambales	Subic	1,628	12,400.00	do.	
Zamboanga	Zamboanga [a]	4,375	271,384.87	Gravity and hydro-electric.	
Total		286,980	2,728,304.28		

[a] Completed in 1921.

[b] Not available.

LIST (D).—*New waterworks projected*

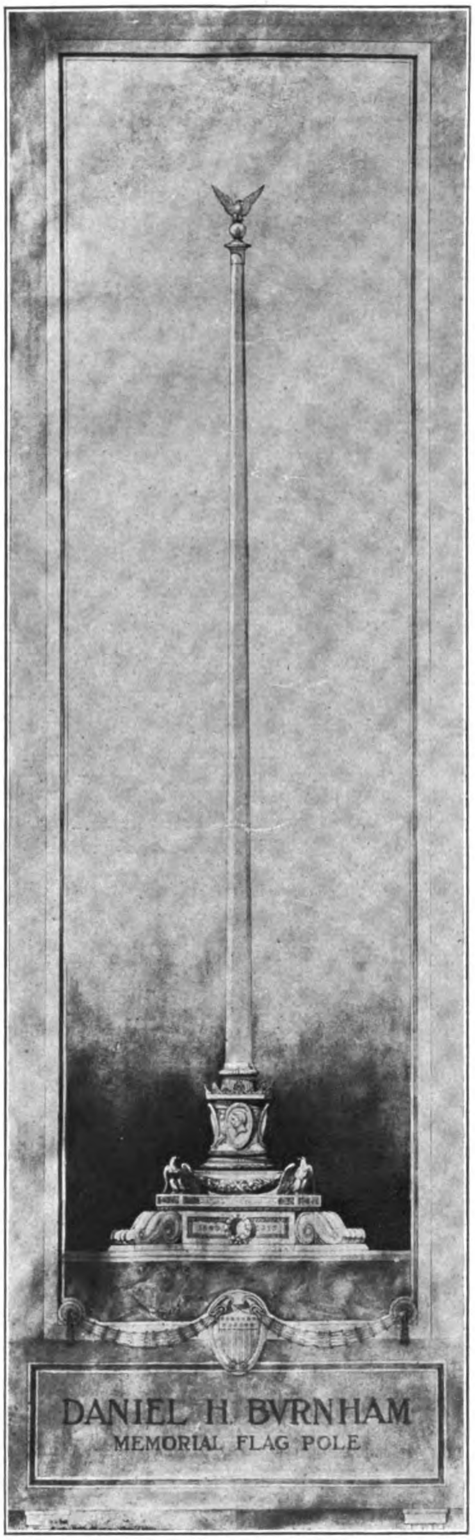
Province.	Municipality.	Estimated cost.	Population.	System.
Albay	Guinobatan	₱45,000.00	5,000	Gravity.
Do.	Albay and Legaspi	60,000.00	11,000	Pumping.
Do	Viga	15,000.00	3,316	
Batanes	Ivana	40,000.00	2,000	Gravity.
Do	Sabtang		748	No data.
Batangas	Balayan extension	1,500.00		Gravity from Balayan tank.
Do	Bauan	69,000.00	4,714	Pumping.
Do	Rosario	30,000.00	5,000	Do.
Bohol	Antiquera	9,000.00	2,600	
Do	Carmen	6,100.00	600	Gravity
Do	Corella	6,000.00	1,019	
Do	Garcia-Hernandez	37,500.00	2,000	Do.
Do	Valencia	20,000.00	1,435	
Bulacan	Malolos	140,000.00	6,000	Pumping.
Do	San Miguel	50,000.00	2,308	Do.
Cagayan	Aparri	1,000,000.00	3,284	Do.
Do	Lal-lo	150,000.00	996	Do.
Do	Tuguegarao	278,000.00	12,000	Do.
Cavite	Cavite	140,000.00	10,911	Pumping.
Do	Indang	42,000.00	3,000	Do.
Do	Silang	62,000.00	4,000	Gravity.
Cebu	Alegria	38,000.00	660	
Do	Asturias	92,000.00	1,086	
Do	Argao	45,000.00	5,500	Do.
Do	Balamban	40,000.00	3,313	
Do	Cordova	7,500.00	1,191	Rain water tank.
Do	Daanbantayan	7,500.00	579	Do.
Do	Dumanjug	39,000.00	3,210	Gravity.
Do	Oslob	15,000.00	2,000	
Do	Pilar	6,000.00	800	Do.
Do	Ronda		1,526	No data.
Do	San Fernando	30,000.00	2,398	
Do	Tabogon		700	No data.
Do	Talisay	30,000.00	2,000	Gravity.
Cotabato	Cotabato	62,000.00	1,250	Ram and gravity.
Ilocos Norte	Laoag	360,000.00	25,000	Gravity.
Ilocos Sur	Bantay		2,500	Do
Do	Santa Lucia		1,908	No data.
Do	Santa	28,000.00	875	Gravity.
Iloilo	Iloilo	₱1,500,000.00	81,500	Gravity.
Do	Pototan	295,000.00	5,672	Do.
Isabela	Ilagan		2,539	No data.
Laguna	Alaminos	12,000.00	1,127	Pumping.
Do	Calamba	20,000.00	3,463	(Not decided.)
Do	Lilio	9,000.00	2,238	
Do	Luisiana	34,000.00	1,811	
Do	Pila	9,000.00	2,171	
Lanao	Dansalan		2,000	Hydro-electric.
Leyte	Baybay	15,000.00	6,000	Pumping.
Do	Burawen		3,038	
Do	Liloan	7,500.00	792	
Do	Maasim	10,000.00	4,167	
Do	Tacloban		6,532	No data.
Manila	San Lazaro Hospital	45,000.00	1,875	Pumping.
Do	School of Arts and Trades.	27,000.00	800	
Mindoro	Looc		1,623	No data.
Do	Caluya		1,477	Do.
Misamis	Misamis	66,000.00	3,450	
Marinduque	Torrijos	23,000.00	5,000	Gravity.
Palawan	Balabac	5,000.00	800	Do.
Do	Cagayancillo		1,066	Rain water tank.
Do	Concepcion	3,600.00	600	Gravity.
Do	Oton	5,000.00	800	Do.
Pangasinan	Lingayen	27,000.00	2,831	Do.
Do	Dagupan		4,436	No data.
Do	Malasiqui	30,000.00	2,613	
Do	San Manuel	52,000.00	4,375	Pumping.
Rizal	Pasig extension	27,000.00	5,200	Do.
Romblon	Looc	36,000.00	2,000	Gravity.
Samar	Calbayog	20,000.00	5,907	
Sorsogon	Barcelona	25,500.00	4,000	Do.
Do	Sorsogon		1,396	No data.
Sulu	Siasi		248	Do.
Surigao	Surigao	70,000.00	6,400	Gravity.
Tayabas	Tiaong	48,000.00	1,800	Do.
Do	Pagbilao	90,000.00	2,300	Do.
Total		5,522,700.00	322,274	

APPENDIX

PROJECTS ACTIVE JANUARY 1, 1922

Provinces.	Roads and trails.				Bridges and culverts.				Provincial administration buildings.				Municipal administration buildings.				Prisons.			Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Construction.	Repair and alteration.	Maintenance.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets and tiendas.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Automobile lines.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Abra	6	3		1																3								1			2		2	18
Agusan	5	4							1															1							1		6	18
Albay	3	1		2						1										1	1					1							4	14
Antique	6	2			1								2							5					1			2					2	21
Bataan	2	3			1					1										2				1									2	12
Batangas	6	2		3	2		1			1			1						1	6	2	3		3	2	4		7				1	23	68
Benguet	9	12			1					1			3	2	1					1	1	1		2	1	5	1	2	1		1	2	5	52
Bohol	6	3								1			2							3					1			3					5	24
Bukidnon	2	3																													1			6
Bulacan	6	4	1		3												1			9		1		2		1		1					8	37
Cagayan	2	2		1						1										3	1			1		1	1						6	19
Camarines Norte	3	1		1		1										1																		7
Camarines Sur	5	2								1			1								2					1							3	15
Capiz	7	2		2	3								1							4		1		2			1						2	25
Cavite	9	2			4															1								1					2	19
Cebu	4	2											2							8		3		1	1	4	3						37	65
Cotabato	9	3		1							1									1				3		2	1				1		8	30
Davao	5	3																		2					2		1	1			2		8	24
Ilocos Norte	3	2	1						1				1			1				3		1	2										2	17
Ilocos Sur	6	3														1				6				1		1	1						3	22
Iloilo	11	3			1								1							6				2		4							4	32
Isabela	3	2		1	1						1		2							6					1		1						2	20
La Laguna	4	2	1		2			1			1									7				2				1					2	23
Lanao	4	3		1		1		1												2				2							2		6	22
La Union	4	6																		9				2									1	22
Leyte	3	2							1				6							3											1		3	18
Manila					1															1						17							56	75
Marinduque	4	2			1															2								1					6	16
Masbate	2	2																				1												5
Mindoro	2	4			2					1									1	3	2				1						1		4	21
Misamis	5	3			3															3				1				1						16
Mt. Province	6	10			2						1		4											1		4	1	3			1	1	18	52
Nueva Ecija	8	3		2	1								4							5				1		1	1	1					7	34
Nueva Vizcaya	4	4																		1		1					1				1		3	15
Occidental Negros	7	2			2															6		1		2			1							21
Oriental Negros	6	5		1	1								2								1			1				1					4	22
Palawan		4																		1		1				2		4			3		8	23
Pampanga	6	2	1		2								1							4				1	2			1					3	23
Pangasinan	11	2			1															13		3		2		1							4	37
Rizal	7	4		1	1					1										14					1	1					2		1	33
Romblon	2	1																		3					1					1			2	10
Samar	3	2	1																	5								1					2	14
Sorsogon	2	2		1									1											1									1	8
Sulu	2	2	1	4																1				1	1	2		1			1	1	12	29
Surigao	2	2									1									2						1		3					2	13
Tarlac	6	3											3							2													2	16
Tayabas	3	3		1	4					1			2							7		3		1	3	2		2					3	35
Zambales	4	2																		1		2				1		1			1			12
Zamboanga	4	4	1							1										3					2								5	20
Total	229	145	7	23	40	2	1	2	3	11	5	....	39	2	1	3	1	....	2	168	10	22	2	37	20	56	14	39	1	1	21	5	289	1,200

NOTE.—Of the 289 projects under the caption "Miscellaneous," there are 19 surveys and investigations of roads, water supply, market sites, etc., 46 artesian wells, 13 port works maintenance, 2 harbor maintenance projects, 10 irrigation systems, 13 wharves, 5 river control projects, 2 custom-houses, 3 dredging projects, 10 dyke projects, 28 Constabulary buildings, 12 irrigation ditches, 7 water tanks, 12 hospitals, 5 piers, 1 dam, and 101 other less important projects.



DANIEL H. BURNHAM MEMORIAL
BURNHAM GREEN (NEW LUNETA)
MANILA, P. I.

BUREAU OF PUBLIC WORKS

◆

STAFF AND PERSONNEL

[Corrected to January 1, 1922]

JOSE PAEZ, *Director of Public Works*
MARCIAL KASILAG, *Acting Chief Constructing Engineer*
E. C. EARLE, *Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer*
TOMAS MAPUA, *Supervising Architect*
JUAN ARELLANO, *Supervising Architect*

CENTRAL OFFICE ORGANIZATION

ADMINISTRATIVE DIVISION

Francisco Cruz, Chief Clerk.
Rosendo Reinoso, Chief Accountant.
T. Camu, Cashier and Disbursing Officer.
Primo Villar, Law and Record Clerk.
Jose de Jesus, Property Clerk.
J. A. V. Corpus, M. E., Acting Superintendent of Automobiles.

DESIGNING DIVISION

W. J. Grodske, Project Engineer.
L. L. Vincent, E. and M. E.
L. H. Thompson, E. and M. E.
J. C. Cookingham, C. E.
R. S. Clemons, E. and M. E.
J. J. Deering, E. and M. E.
M. C. Collins, C. E.
T. A. Mills, C. E.
J. Vallarta, C. E.
D. Guanio, C. E.
J. Piedad, C. E.
E. Segui, C. E.
A. Villanueva, Assistant C. E.
V. Gloria, Assistant C. E.
V. Villanueva, Assistant Electrical Engineer.
W. Berry, Pile Driver Superintendent.

DIVISION OF ARCHITECTURE

C. Mandelbaum, Chief Draftsman.
A. Toledo, Supervising Architectural Draftsman.
T. Macabulos, C. E.
G. Vales, C. E.
A. Tayzon, C. E. and Estimator.
A. Diaz, J. C. E.

CONSTRUCTING DIVISION

N. S. Saleeby, Highway Engineer.
A. T. Sylvester, Constructing Engineer.
V. L. Legarda, C. E.
H. C. Garretson, C. E.
I. Garcia, Superintendent Maintenance, Alteration and Repair.
H. Franco, Chief Electrician.
Fred. McCaw, Acting Superintendent of Artesian Wells.
V. Castillo, Superintendent of Dredges.
J. T. Bootes, Superintendent of Dredge Construction.
Q. Camus, Traveling Inspector.
R. Custodio, Superintendent of Construction, Batanes.

IRRIGATION DIVISION

G. G. Stroebe, Hydraulic Engineer.
P. W. Mack, C. E.
E. Quisumbing, Designing Engineer.
W. J. Lamon, Project Engineer.
E. L. Driggs, Project Engineer.
Nicanor Cortes, C. E.
V. A. Tan, C. E.
A. Martinez, C. E.
Leon Ines, Project Engineer.
Gonzalo Garcia, Project Engineer.
R. Nostratis, Project Engineer.
H. O. Bauman, Project Engineer.
J. Gochoco, Acting Chief Hydrographer.
H. S. Clemente, C. E.
M. Gonzales, Assistant C. E.
G. de Leon, Assistant C. E.
G. Gruel, Acting Project Engineer.
V. Alcaneses, J. C. E.
W. Demers, Supervising Hydrographer.
A. Baldonado, District Hydrographer.
L. Novenario, District Hydrographer.
A. Abaya, Chief Water Rights Inspector.
M. Villalobos, Assistant Water Rights Inspector.
M. N. Leones, Supervising Surveyor.

DISTRICT ORGANIZATION

E. J. Halsema, D. E. and S. E., Benguet.
M. Diaz, Acting D. E., La Union.
R. Peredo, Acting D. E., Mountain Province.
Dalmacio Urtula, D. E. and S. E., Albay.
S. Bayan, Acting D. E., Camarines Norte.
S. Tan Chauco, Acting D. E., Camarines Sur.
J. F. Imperial, Acting D. E., Sorsogon.
S. Nery, Overseer, Sorsogon.
Luis Francisco, D. E. and S. E., Tayabas.
H. Lanuza, Overseer, Tayabas.
Melecio Arranz, D. E. and S. E., Rizal.
M. C. Navarro, Assistant C. E., Rizal.
J. Galza, Overseer, Rizal.
V. F. Lavadia, Acting D. E., Cavite.
J. V. Bagtas, D. E., Laguna.
C. Bauza, Overseer, Laguna.
F. V. Larracas, D. E., Batangas.
J. Villanueva, Overseer, Batangas.
M. M. Resplandor, Acting D. E., Mindoro.
R. Villalon, Acting D. E., Marinduque.
T. Mocorro, Acting D. E., Palawan.
Juan Macaraeg, D. E. and S. E., Zamboanga.
Fred J. Legare, Overseer, Zamboanga.
C. Cabilete, Acting D. E., Lanao.
W. J. Hollis, Acting D. E., Sulu.
S. R. Relis, Surveyor, Sulu.
J. Lozada, Acting D. E., Davao.
V. C. Bustamante, Surveyor, Davao.
J. Follosco, Acting D. E., Cotabato.
C. C. Moreno, Junior Surveyor, Cotabato.
B. Villanueva, Acting D. E., Misamis.
M. Operario, J. C. E., Misamis.
M. Angeles, Acting D. E., Bukidnon.
A. V. Martinez, Acting D. E., Agusan.
Alejo Aquino, Acting D. E. and S. E., Iloilo.
F. P. Reynolds, Assistant C. E., Iloilo.
A. F. de Castro, Assistant C. E., Iloilo.
R. O. Ylagan, J. C. E., Iloilo.
A. P. Nitorreda, D. E., Capiz.
H. I. Fernandez, J. C. E., Capiz.
R. Garcia, Acting D. E., Antique.
J. Arquisola, Acting D. E., Romblon.
J. Wright, Acting D. E., Masbate.
Mamerto Cruz, D. E. and S. E., Cagayan.
T. Lorenzo, Assistant C. E., Cagayan.
A. N. Cobangbang, Assistant C. E., Cagayan.
L. Urtizberea, Acting D. E., Isabela.
V. Oledan, Acting D. E., Nueva Vizcaya.
E. D. Smith, D. E. and S. E., Ilocos Sur.
B. F. Saldana, Assistant C. E., Ilocos Sur.
A. Medina, J. C. E., Ilocos Sur.
G. Alcantara, Acting D. E., Ilocos Norte.
F. Romero, Superintendent of Construction, Ilocos Norte.
Saturnino Lopez, D. E. and S. E., Pangasinan.
R. A. Acosta, J. C. E., Pangasinan.
V. Orosa, D. E., Nueva Ecija.
I. Fernando, C. E., Nueva Ecija.
G. J. Militante, Assistant C. E., Nueva Ecija.
J. Laguardia, Acting D. E., Tarlac.
M. A. de Castro, Acting D. E., Pampanga.
S. Fernandez, D. E., Bulacan.
P. C. Mojica, Acting D. E., Zambales.
J. Ignacio, Acting D. E., Bataan.
L. T. Clark, D. E. and S. E., Cebu.
V. Segura, C. E., Cebu.
T. J. Medicielo, C. E., Cebu.
A. Osmeña, Assistant C. E., Cebu.
J. Gandionco, Acting D. E., Oriental Negros.
Vicente Fragante, D. E. and S. E., Occidental Negros.
A. Florendo, Assistant C. E., Occidental Negros.
M. Domingo, Assistant C. E., Occidental Negros.
M. Dimson, Acting D. E., Bohol.
H. R. Meehleib, Acting D. E., Leyte.
R. Borromeo, J. C. E., Leyte.
M. F. Chiyuto, J. C. E., Leyte.
Pastor Avisado, D. E., Samar.
F. Piczon, J. C. E., Samar.
C. F. Rama, Surveyor, Samar.
L. Ortiz, Acting D. E., Surigao.

LEGEND

S. E. = Supervising Engineer.
C. E. = Civil Engineer.
D. E. = District Engineer.
E. & M. E. = Electrical and Mechanical Engineer.
J. C. E. = Junior Civil Engineer.

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THE BUREAU OF PUBLIC WORKS BULLETIN

Vol. 11 JANUARY 1, 1923 No. 1

STANDARD TYPE OF NOTCHED FALL, MAIN CANAL, TALAVERA RIVER IRRIGATION SYSTEM, NUEVA ECIJA, P. I.

198148

CONVERSION TABLE

One peso (₱1) = 50 cents, U. S. currency.
One kilometer (Km.) = 0.62 miles.
One kilogram (Kg.) = 2.20 pounds (lbs.).
One centimeter (cm.) = 0.39 inches.
One meter (m.) = 3.28 feet.
One hectare = 2.47 acres.
One cubic meter (cu. m.) = 1.31 cubic yards.
One hectare meter per day = 8.107 acre feet per day.
One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) second feet.

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1922

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

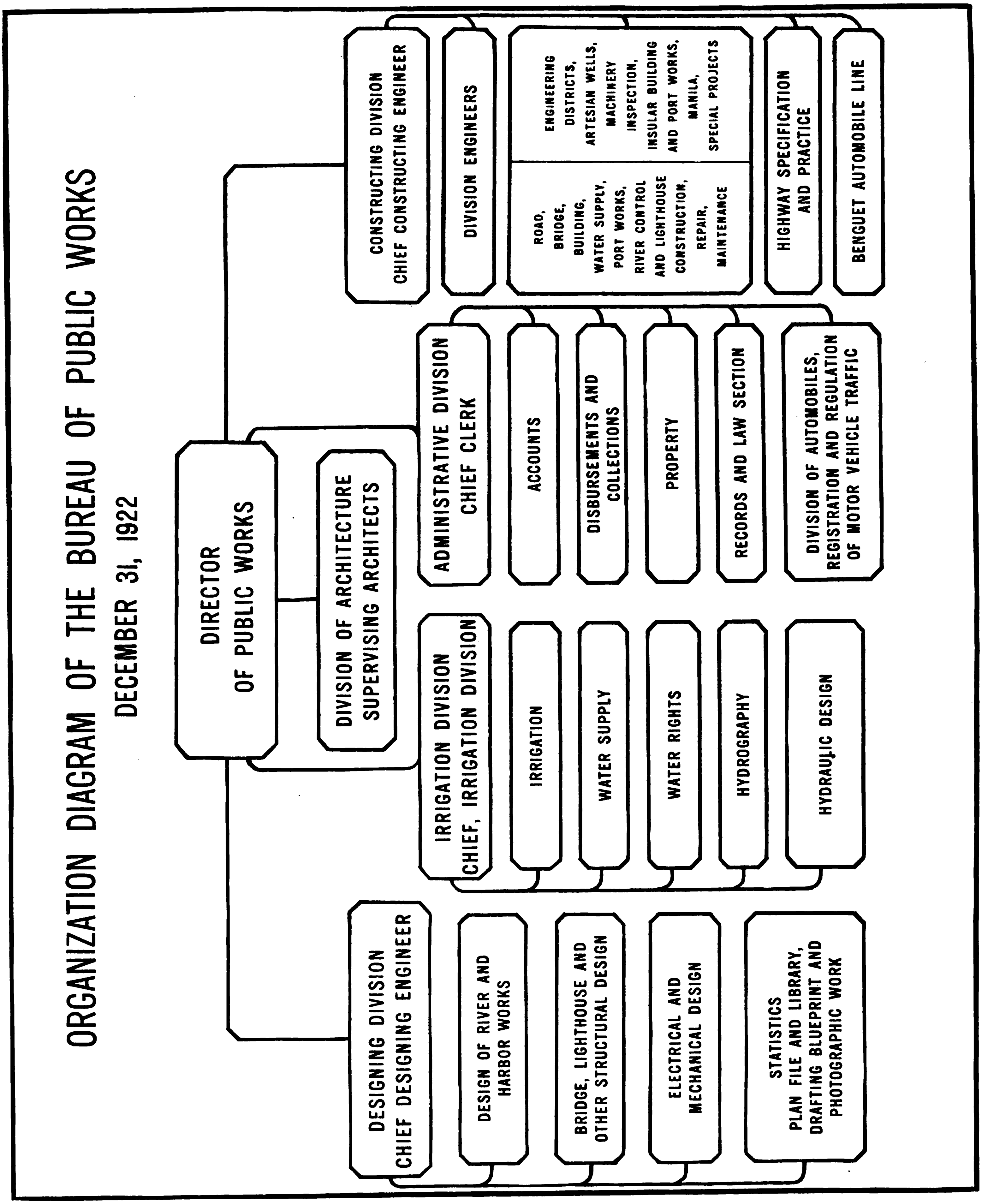
MANILA, P. I., February 15, 1923

Sir: I have the honor to submit herewith the Report of the Bureau of Public Works for the fiscal year ending December 31, 1922.

Very respectfully,

JOSE PAEZ
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.



ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1922

DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS PLAN FILE AND LIBRARY, DRAFTING BLUEPRINT AND PHOTOGRAPHIC WORK
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
ADMINISTRATIVE DIVISION CHIEF CLERK
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
DIVISION ENGINEERS
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE

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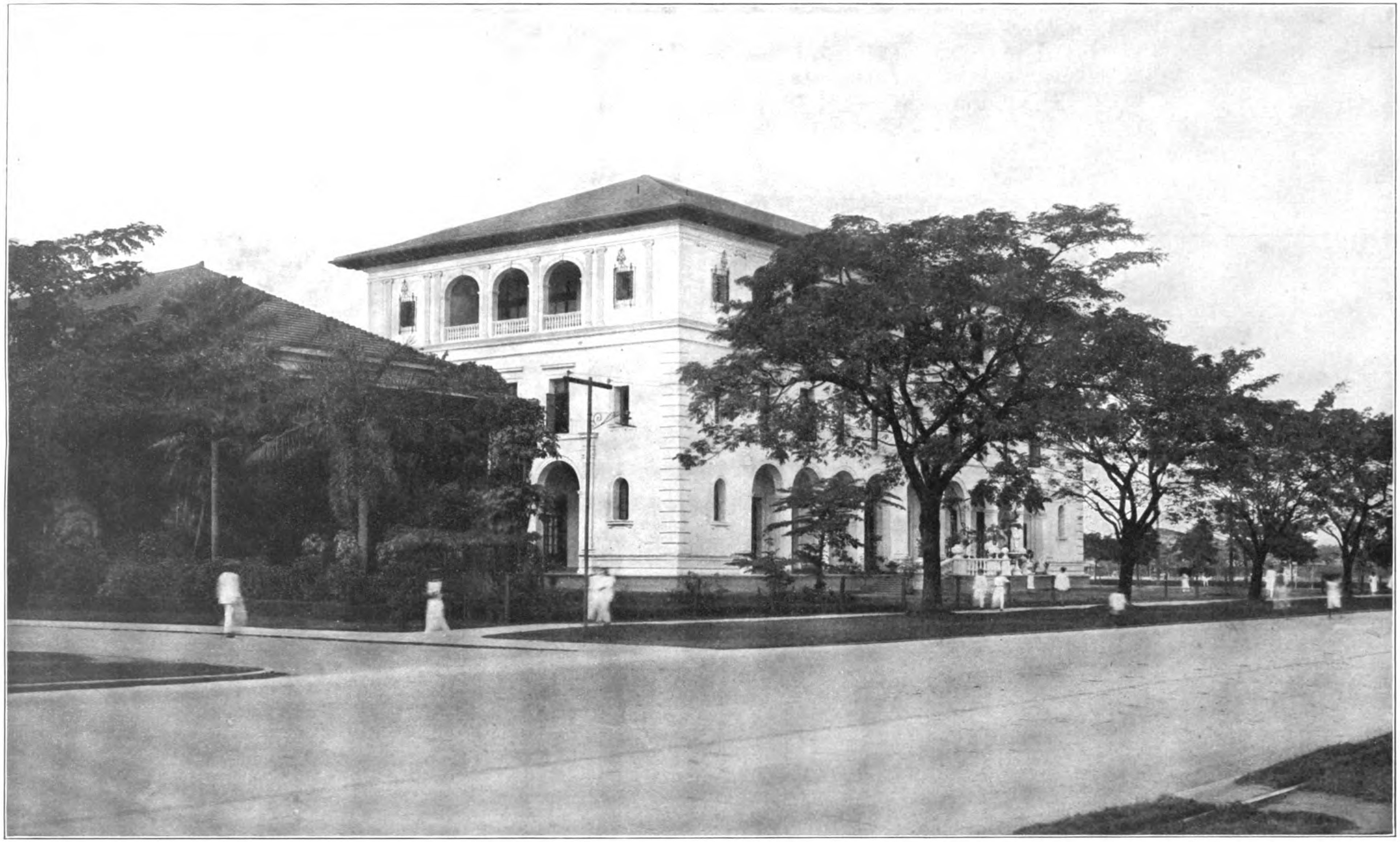


NEW NURSES DORMITORY, PHILIPPINE GENERAL HOSPITAL, MANILA, P. I., JANUARY, 1923

General view from Taft Avenue, showing old dormitory at the left. Front entrance driveway and walks not yet constructed

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

During the year 1922 the reorganization of the Constructing Division field personnel was carried out. The 48 engineering districts comprising the Philippine Archipelago were divided into six engineering divisions. At the head of each division an experienced engineer of demonstrated executive ability, called Division Engineer, was placed, his principal and exclusive duties being the supervision of all the work carried on in the various provinces or engineering districts. Very gratifying results have been obtained. The Central Office was placed in closer contact with the field force; better supervision and control of the various projects and greater economy and and efficiency in the execution thereof were attained.

This Bureau believes that its success depends in a large measure upon its ability to retain experienced employees, particularly technical men, in its service, and that continual changes in its personnel will adversely affect the efficiency of the service. For this reason and because the technical personnel of this Bureau, particularly the district engineers, are unreasonably underpaid, and because of the further fact that considerable difficulty is met in retaining the services of older and experienced engineers whenever a better offer for their employment is made by private firms, this Office respectfully recommends that the salaries of the public works employees be standardized in accordance with the importance of the position occupied and the responsibility attached thereto. The district engineers should be given salaries commensurate with their duties and responsibilities; at any rate, not in great disproportion to the remuneration received by other provincial officials.

PERSONNEL

Number of employees paid direct from Bureau Funds as of December 31, 1922: Americans, 26; Filipinos 302.

(NOTE.—The corresponding figures for December 31, 1921, are 35 and 347, respectively.)

Number of technical employees, December 31, 1922: Americans, 20; Filipinos 108.

(NOTE.—The corresponding figures for December 31, 1921, are 27 and 99, respectively.)

American technical employees

	Classified	Uuclassified	Total
Civil engineer	14	0	14
Assistant engineer	1	0	1
Electrical-mechanical engineer	2	1	3
Structural engineer	0	0	0
Surveyor	1	0	1
Architect	1	0	1
Total	19	1	20

Filipino technical employees

	Classified	Unclassified	Total
Civil engineer	31	7	38
Assistant engineer	0	3	3
Assistant civil engineer	23	6	29
Junior civil engineer	4	17	21
Surveyor	5	4	9
Junior surveyor	1	0	1
Assistant electrical engineer	1	0	1
Junior electrical engineer	1	0	1
Supervising architect	2	0	2
Architect	2	0	2
Mechanical engineer	1	0	1
Total	71	37	108

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau, by whatever branch of the Government paid:

	American	Filipino	Total 1922	Total 1921
Number of appointments	1	271	272	759
Number of transfers to Bureau	0	4	4	8
Number of separations for cause	0	20	20	58
Number of voluntary resignations	4	179	183	181
Number of transfers from Bureau	0	12	12	11
Number of separations due to Retirement	4	1	5	5
Number of separations due to expiration of employment	0	9	9	25
Number of deaths	0	6	6	7

NOTE.—Item "Number of appointments" includes new and probational appointments.

The results obtained by the Bureau of Public Works during the year 1922, which are set forth in detail in the following report and tabulations, are very satisfactory, considering the scarcity of funds prevailing during the year and the increased need for maintenance expenditures.

The total expenditures incurred under the supervision of the Bureau of Public Works during the year amounted to ₱20,917,114.45, of which approximately 47 per cent was furnished by provinces and municipalities. It will be noted from the Operation Statement that the Bureau was operated at a profit of ₱128,074.13 during 1922, as compared with ₱121,615.33 for 1921, the years 1921 and 1922 being the only fiscal years in which this Bureau accomplished its work at a porfit since its organization.

Due to shortage of funds and to the inability of a great number of provinces to provide even the necessary amount for road maintenance, road and bridge construction was greatly curtailed. On the other hand, greater attention was given to the maintenance and improvement of existing roads to meet present-day traffic requirements. During the year 8,516.9 kilometers of first-, second-, and third-class roads were regularly maintained, either by the caminero, or gang system, at a total cost of ₱5,017,871.17. This is the largest kilometrage of road ever maintained and exceeds that of the preceding year by 409.8 kilometers.

The construction of public buildings has likewise been effected by the limited funds available during 1922. The most important projects undertaken during the year in Manila were the continuance of work on the Legislative Building; the completion of the Nurses' Dormitory and the Supreme Court Addition; and the reconstruction of the Intendencia Building. During the year a total of 110 permanent buildings of over 100-cubic meter capacity were completed in various parts of the Islands, comprising schools, presidencias, markets, hospitals, and other miscellaneous structures.

Very satisfactory progress was made on the construction of Pier No. 7. It is anticipated that work on this pier will proceed more rapidly than heretofore, as pile driving operations in the most difficult section of the project have now been finished. With the release of the additional funds requested for the completion of this structure, it is expected that one-half of the new pier will be available for commercial use during the latter part of 1923, and that the entire pier will be completed in 1924.

Work on the various insular irrigation system was actively resumed upon the release of ₱3,440,000 from the Irrigation Bond funds. Two (2) insular systems, viz., the Santa Barbara Irrigation System, Iloilo Province, and the Dingras Irrigation System, Ilocos Norte Province, were completed at a combined total cost of ₱822,000, and water was furnished for the 1922 rice crop. The irrigable area under the Santa Barbara Irrigation System is 4,986 hectares and under the Dingras Irrigation System, 1,010 hectares. Work on seven (7) irrigation systems to benefit a total area of 48,100 hectares, at an estimated cost of ₱7,880,000 was continued throughout the year and it is expected that four (4) of these systems will be completed before the middle of 1923. The total expenditures made on irrigation projects during the year amounted to ₱2,577,468.52.

Eleven (11) waterworks projects were completed during the year at a total cost of ₱421,625.58, serving a total population of approximately 25,000. At the close of the year, there were 32 projects under construction to supply water to a population of approximately 87,000, at an estimated costs of about ₱1,734,000.

There were 100 artesian wells drilled during the year at a cost of ₱309,801.11, which serve approximately 244,000 people.

It will be noted that the Benguet Automobile Line was operated during 1922 at a profit of ₱24,208.85.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS

Items	Insular expenditures				Provincial and municipal expenditures		Fund from private source		Total	
	Bureau of public works		Appropriation controlled by other Bureau							
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922
Roads and bridges	₱586,527.34	₱146,610.20	₱240,391.83	₱72,935.57	₱6,347,725.07	₱6,629,621.77	....	....	₱7,174,644.24	₱6,849,167.54
Telegraph, telephone, cable lines, etc	....	20,835.34	....	....	....	....	....	....	....	20,835.34
Buildings	2,334,223.65	1,387,766.86	252,905.03	15,712.02	3,532,026.10	2,431,095.37	₱19,771.64	(₱1,856.19)	6,138,926.42	3,832,718.06
Wireless station Buildings, including towers and masts	36,403.88	209,476.28	133,995.12	57,826.22	....	....	....	....	170,399.00	267,301.50
Maintenance, alteration and repair of public buildings	519,036.51	487,963.12	(54,447.27)	732.67	341.32	117,821.98	377.76	(3.16)	463,308.32	606,514.61
River and harbor work, purchase and reconstruction of light, buoys, and beacons, including equipment	2,098,614.75	5,317,036.09	2,784,652.00	88,219.69	17,645.62	19,764.33	1,045.32	....	4,901,957.69	5,425,020.11
Artesian wells and water supply	313,525.46	304,835.21	47,183.41	16,809.09	715,983.50	413,701.07	33,673.08	3,949.40	1,110,365.45	739,294.77
Irrigation projects	1,627,623.73	2,552,554.09	3,577.68	14,888.35	30,556.11	7,006.13	1,047.00	3,019.95	1,662,804.52	2,577,468.52
Benguet auto line	140,000.00	88,707.55	....	....	....	....	....	....	140,000.00	88,707.55
Registration and regulation of motor vehicle traffic	64,000.00	47,774.93	....	....	....	....	....	....	64,000.00	47,774.93
Los Baños quarry	150,000.00	106,300.15	....	....	....	....	....	....	150,000.00	106,300.15
Miscellaneous	1,046.68	2,000.00	214,561.72	166,381.21	393,653.33	182,410.68	8,576.38	5,219.48	617,840.11	856,011.37
Total	7,671,002.00	10,671,658.82	3,622,619.52	433,504.82	11,037,931.05	9,801,421.33	64,493.18	10,329.48	22,596,245.75	20,917,114.45

NOTE.—The amount of ₱157,641.01 for roads and bridges under the Appropiation controlled by other Bureaus was erroneously omitted from the report of 1921.

BALANCE SHEET, BUREAU OF PUBLIC WORKS

Assets	1921	1922
CURRENT:		
Cash—		
Collecting and disbursing officers	₱1,422,961.04	₱1,191,542.57
Deposit Insular Treasury	1,344,781.96	6,257,295.08
Accounts receivable	2,429,327.33	929,136.95
Supplies and materials	1,045,835.86	876,591.66
Work in process	....	22.57
Prepayments	10,718.29	296.65
INVESTMENT:		
Loan to municipality of Antipolo	20,000.00	20,000.00
Total Current Assets	6,273,624.48	9,274,885.43
FIXED PROPERTY:		
Real property and improvement	33,017,057.94	41,140,879.22
Equipment	3,208,318.51	3,445,561.96
(Less depreciation)	(1,115,060.21)	(1,120,828.48)
	41,383,940.72	52,740,498.13

Liabilities	1921	1922
CURRENT:		
Accounts payable	₱364,948.58	₱1,250,842.95
Accrued leave payable	175,088.47	239,779.82
Undistributed collections	4,703.12	28.45
Insurance reserve	61,390.78	233.09
Deferred credits to income	38,135.18	6,227.29
CURRENT SURPLUS:		
Registration and regulation of motor vehicles, Act 3045	....	144,834.15
Wireless station buildings and towers	146,422.12	50,156.74
Construction of buildings and acquisition and improvements of grounds	920,935.79	1,156,402.72
Maintenance, alteration and repair of public buildings	199,808.91	168,345.79
Irrigation systems	1,899,518.46	3,109,791.51
Artesian wells and water works	24,474.21	105,669.00
Harbor and river improvements	2,103,109.23	1,298,798.87
Lighthouses, buoys and beacons	1,020.73	....
Roads and bridges	48,068.90	974,615.39
Investigation of projects	23,000.00	....
Telegraphs, telephones, cables, etc	263,000.00	769,164.66
Total current liabilities	6,273,624.48	9,274,885.43
PRINCIPAL ACCOUNT SURPLUS:		
Invested in fixed property	35,110,816.24	43,465,612.70
	41,383,940.72	52,740,498.13

STATEMENT OF APPROPRIATION, INCOME AND EXPENSES

Debit	1921	1922
Reversion of unexpended balance of administrative appropriation	₱129,150.25	₱43,612.76
Reversion of receipts	1,332,498.65	1,182,374.40
Operating expenditures offset by receipts	10,704,898.12	9,352,296.11
Expenditures administrative appropriation	1,210,883.32	1,053,837.49
Outlays, purchase of equipment	6,800.00	462.70
Total	13,384,230.34	11,632,583.54

Credit	1921	1922
Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱1,346,833.57	₱1,097,913.03
Receipt—prime cost	10,704,898.12	9,352,296.11
Receipts—surcharges	1,192,957.74	1,051,834.36
Receipts—miscellaneous	56,169.42	55,193.72
Gain on supplies sold	3,582.18	2,616.42
Inventory adjustments	3,332.08	2,719.76
Income from rentals	20,567.77	15,367.45
Interest on investment and securities	120.00	....
Sales of fixed assets	1,440.67	975.85
Prior year's credit	54,328.79	53,666.84
Total	13,384,230.34	11,632,583.54

TRANSACTION AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) DURING 1922

	1921	1922
Principal account surplus, December 31	₱29,716,075.47	₱35,110,316.24
Purchase of equipment (general funds)	6,800.00	462.78
Fixed property brought into account and purchase of equipment from specific appropriations	5,414,309.20	8,383,125.12
Equipment acquired by transfer	4,301.51	18,602.75
Equipment found at station including worn out tires taken into account	205.00	3,207.48
Equipment acquired by construction	507.37	283.96
Total debits	35,142,198.55	43,515,998.38

	1921	1922
Equipment sold	₱1,391.79	₱968.85
Equipment condemned	72,884.84	10,127.92
Equipment dropped by transfer to provinces and municipalities	....	13,068.28
Equipment and fixed assets dropped by transfer to other Bureaus	254.57	20,382.40
Equipment issued to jobs	335.46	69.91
Depreciation written off	(42,984.35)	5,768.27
Principal account surplus, December 31	35,110,316.24	43,465,612.70
Total credits	35,142,198.55	43,515,998.33

OPERATION STATEMENT, BUREAU OF PUBLIC WORKS

Operating revenue	1921	1922
Rental	₱20,567.77	₱15,367.45
Surcharges	1,192,957.74	1,051,834.36
Gain on goods sold	3,582.18	2,616.42
Interest on investment and securities	120.00	....
Inventory adjustments	3,332.08	2,719.76
Other service income	111,938.88	109,836.41
Total	1,332,498.66	1,182,374.40

Operating expenses	1921	1922
Supervising, technical and clerical service:		
Salaries	₱893,560.85	₱836,998.07
Bonuses	79,684.27	....
Labor	67,818.20	62,795.62
Consumption of materials	69,122.49	60,788.16
Rental of buildings	24,120.00	24,120.00
Illumination and power service	10,164.19	7,532.71
Traveling expense of personnel	22,446.67	27,082.91
Repair service	16,345.11	7,375.12
Postal, telegraph, telephone, and cable service	11,667.50	11,271.85
Other expenses	15,954.04	16,335.83
Operating profit	121,615.33	128,074.13
Total	1,332,498.65	1,182,374.40

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first-class	Kilometers	145.9
Reinforced concrete bridges and culverts completed	Number	17
(In this figure, concrete pipe culverts are not included)		
Successful deep wells completed	Number	100
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	Number	67

Expenditures supervised during the year 1922 as compared with the year 1921

	1921	1922
Total expenditures	₱22,438,604.74	₱20,917,114.45
(Plus amount erroneously omitted from 1921 report)	157,641.01	....
Total expended upon road and bridge work	7,017,003.23	6,849,167.54
(Plus amount erroneously omitted from 1921 report)	157,641.01	....
Total expended upon building work	6,774,633.74	4,706,534.17
Total expended upon port works	4,901,957.69	5,425,020.11
Total expended upon water supply	1,110,365.45	739,294.77
Total expended upon irrigation projects	1,662,804.52	2,577,468.52
Operation of auto line, quarries and the supervision of motor vehicle traffic	354,000.00	242,782.63
Expenditures on miscellaneous items account for the balance	....	....

ROAD WORK

Roads in existence in the various provinces of the Philippines as of December 31, 1922

Province	First-class road	Second-class road	Third-class road	Total road	Trails
	Kilometers	*Kilometers*	*Kilometers*	*Kilometers*	*Kilometers*
Abra	54.3	18.3	5.8	78.4	98.7
Agusan	17.3	7.1	20.2	44.6	49.3
Albay	181.5	46.8	54.9	283.2	83.5
Antique	104.4	106.5	13.0	223.9	18.5
Baguio	41.2	.7	2.2	44.1	2.2
Bataan	34.6	20.6	2.3	57.5	75.7
Batangas	186.5	19.4	156.7	362.6	38.7
Benguet	75.3	4.9	20.8	101.0	....
Bohol	207.5	85.4	30.5	323.4	8.0
Bukidnon	....	97.0	16.7	113.7	94.4
Bulacan	103.9	118.5	87.5	309.9	....
Cagayan	62.6	99.7	18.9	181.2	139.8
Camarines Norte	24.0	5.2	17.7	46.9	....
Camarines Sur	137.3	31.4	64.7	233.4	25.1
Capiz	179.8	107.8	12.5	300.1	85.7
Cavite	75.4	33.6	12.7	121.7	106.8
Cebu	304.4	237.5	104.5	646.4	60.7
Cotabato	13.3	1.9	57.1	72.3	256.1
Davao	12.9	6.5	45.9	65.3	598.2
Ilocos Norte	78.4	102.6	6.7	187.7	48.1
Ilocos Sur	170.5	29.7	56.1	256.3	95.1
Iloilo	266.0	57.2	155.6	478.8	11.6
Isabela	79.9	28.2	116.0	224.1	....
Laguna	148.3	19.2	64.3	231.8	29.4

Roads in existence in the various provinces of the Philippines as of December 31, 1922—Continued

Province	First-class road	Second-class road	Third-class road	Total road	Trails
	Kilometers	*Kilometers*	*Kilometers*	*Kilometers*	*Kilometers*
Lanao	40.8	19.8	21.7	82.3	259.8
La Union	90.5	29.4	34.3	154.2	5.9
Leyte	120.1	62.0	80.5	262.5	42.7
Marinduque	41.1	.5	9.4	51.0	75.1
Masbate	32.2	9.6	11.9	53.7	....
Mindoro	19.0	41.2	11.5	71.7	95.3
Misamis	103.6	94.6	79.6	277.7	145.3
Mountain Province	....	13.0	253.5	266.5	1,006.4
Nueva Ecija	156.7	45.4	223.2	425.3	15.0
Nueva Vizcaya	34.2	26.6	80.6	141.4	136.7
Occidental Negros	285.5	34.3	224.8	544.6	41.7
Oriental Negros	143.6	18.0	73.1	234.7	193.8
Palawan	....	8.5	25.9	34.4	90.7
Pampanga	196.9	62.0	83.8	342.7	....
Pangasinan	352.8	106.2	197.6	656.6	....
Rizal	174.6	16.3	19.0	209.9	18.0
Romblon	....	4.6	5.3	9.9	284.6
Samar	103.4	46.0	103.4	252.8	38.8
Sorsogon	85.6	65.5	29.6	180.7	....
Sulu	20.3	14.8	7.0	42.1	86.7
Surigao	51.6	2.0	7.4	61.0	15.0
Tarlac	115.9	7.8	55.4	179.1	27.4
Tayabas	157.2	35.1	65.1	257.4	....
Zambales	38.6	43.4	38.2	120.2	23.4
Zamboanga	58.9	23.2	57.6	139.7	115.5
Total	4,982.3	2,115.5	2,942.7	10,040.5	4,647.0

Tabulation of increase in road kilometerage during 1922 by provinces

Province	Road in existence December 31, 1921	Road in existence December 31, 1922	Increase during 1922
Abra	49.0	54.3	5.3
Albay	179.5	181.5	2.0
Batangas	184.2	186.5	2.3
Bohol	185.3	207.5	22.2
Cagayan	54.5	62.6	8.1
Camarines Sur	138.0	137.3	[a] (.7)
Cavite	82.2	75.4	[b] (6.8)
Cebu	295.5	304.4	8.9
Cotabato	12.8	13.3	.5
Davao	5.8	12.9	7.1
Ilocos Sur	165.6	170.5	4.9
Laguna	147.9	148.3	.4
Lanao	30.4	40.8	10.4
Marinduque	40.3	41.1	.8
Nueva Ecija	144.6	156.7	12.1
Nueva Vizcaya	32.2	34.2	2.0
Occidental Negros	272.2	285.5	13.3
Oriental Negros	138.6	143.6	5.0
Pangasinan	326.4	352.8	26.4
Rizal	161.3	174.6	13.3
Sorsogon	85.2	85.6	.4
Sulu	29.1	20.3	[b] (8.8)
Surigao	46.9	51.6	4.7
Tarlac	113.8	115.9	2.1
Tayabas	148.2	157.9	9.0
Zambales	37.6	38.2	1.0
Total	....	....	145.9

[a] Decrease due to remeasurement.

[b] Decrease due to reclassification (16).

DEFINITION FOR ROAD CLASSIFICATIONS

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first- and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing

	December 31, 1921	December 31, 1922
	Kilometers	*Kilometers*
Stone	1,428.4	1,476.6
Gravel	3,210.0	3,323.8
Coral	1,460.8	1,554.2
Unsurfaced	3,818.6	3,685.9
Total	9,917.8	10,040.5

BRIDGES

Durable bridges and culverts in existence

Fiscal year ending—	All durable structures	
	Total number	Increase during year
June—		
1910	4,372	507
1911	4,842	470
1912	5,177	358
1913	5,654	508
December—		
1913 (6 months)	5,901	190
1914	6,206	305
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	56
1919	7,491	65
1920	7,521	30
1921	7,481	[a] 40
1922	7,562	81

[a] Decrease.

NOTE.—The term "durable bridges and culvert" includes structures of reinforced concrete, steel, brick, and all substantial stone structures whether of adobe or other material. The increase of 81 structures includes those actually completed during the year as well as those which should have been previously reported minus structures reported missing for the first time. The above figures are obtained from semi-annual reports of district engineers.

Reinforced concrete structures in existence

Fiscal year ending—	Total number	Total meters
June—		
1910	([a])	([a])
1911	2,004	7,709
1912	2,350	9,216
1913	2,854	11,224
December—		
1913 (6 months)	3,046	11,964
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280
1922	4,366	17,684

[a] No data.

NOTE.—All reinforced concrete structures were built during the period of American administration, together with a large number of steel and other class of construction.

ARTESIAN WELLS

Successful deep wells driven, by fiscal years

Year	Number of wells completed[a]	Total depth in feet
1918	165	42,884
1919	163	40,119
1920	148	49,520
1921	125	38,203
1922	100	32,648

[a] Not including unsuccessful wells completed and wells under construction at the close of the year.

A glance at the foregoing comparative statement of results accomplished during the last five years gives the idea that the activities of the Bureau of Public Works in 1922 in artesian well drilling have fallen far behind the mark set up in 1918. But this is explained by the fact that, of the 32 deep well rigs which this Bureau has available for drilling wells, only an average of 15¾ rigs per month were in active operation during the year, as against 22 rigs in continuous operation in 1918. Coupled with this was the fact that the 1922 Insular appropriations for drilling artesian wells were not made available until the early part of April, which delay has caused the shutting down of several rigs, due to exhaustion of funds, for a period of over three months. Then again, it must be borne in mind that shutting down a drilling rig does not decrease to a considerable extent the expenditures to be met by the Bureau, inasmuch as the depreciation costs of the machines,—particularly in the case of those stationed near the sea, the deterioration of equipment and other incidental expenses, not to mention delays due to breaking in of new men when restarting the rig, and the reëquipping of the machine, make it in the long run just as costly, if not more so, to temporarily lay up a drilling machine, than to keep it in continuous operation. Another factor which has considerably increased the cost of operation of our drilling machines, and at the same time decreased the number of finished wells, is the delay caused by Municipal Councils and Provincial Boards in failing to submit promptly proper resolutions requesting the drilling of artesian wells, as prescribed in Provincial Circular No. 216 of the Executive Bureau.

The total number of successful wells drilled by the Bureau of Public Works, from 1904 to 1922 is 1,468. These wells supply 36,450,000 gallons of potable water per 12-hour day, which, at the rate of 20 gallons per capita per day of 12 hours, would supply no less than 1,822,500 people daily.

Total expended upon wells

	1922		1921	
	Pesos	*Per cent*	*Pesos*	*Per cent*
Successful wells	309,801.11	88	338,770.54	91
Unsuccessful wells	42,318.26	12	33,481.12	9
Total	352,119.37	100	372,251,66	100

Average cost of drilling, per meter (including the unsuccessful artesian wells): 1922, ₱31.64; 1921, ₱28.51.

Summary of deep well drilling, 1922

	Number	Total depth in meters	Total flow in liters
Successful:			
Flowing	38	5,306	5,599
Pumping	62	4,645	7,211
Total: Successful	100	9,951	12,810
Unsuccessful	13	1,179	....
Grand total	113	11,130	12,810

ARTESIAN WELL EQUIPMENT AND PERSONNEL

The drilling operations for the year started with 19 deep well rigs in the field and 14 machines in the property Division. The machines brought to Manila were either in need of repairs or were awaiting assignment. Of the 23 deep well rigs which were later placed in the field, 15 were actively engaged in drilling work and the others were temporarily suspended either on account of delays on the part of the Municipal Councils and Provincial Boards in assigning the well locations due to lack of municipal funds, or when moving from one well site to another.

The personnel in charge of the operation of these machines at the beginning of the year consisted of 26 well drillers, 5 supervising well drillers, 1 district superintendent, and 1 general field superintendent. In accordance with the retrenchment policy of the Government, this force was gradually reduced to the lowest possible limit consistent with efficiency and at the end of the year only 20 well drillers, 5 supervising well drillers, and 1 general field superintendent were retained in the service. Although only six machines were in active operation at the end of the year, yet the Bureau had to retain the services of 20 well drillers, to man 20 drilling machines in the field, and keep them in good working condition so that work may be resumed as soon as the 1923 Insular appropriations for artesian wells is released. However, due to the fact that the initial allotment for artesian wells, was not released until April, the drilling crews of 12 machines were gradually discharged beginning in August, when the funds ran low and when there was no indication that the unreleased portion of the appropriation would be made available. So, practically, the Artesian Well Section was actively engaged in well drilling for only five months of the year, namely, from April to August.

In spite of this handicap 113 wells were completed during the year aggregating 36,516 feet in depth. Of these, 100 wells were successful and will furnish potable water to approximately 243,648 people. At the close of the year six wells were under construction, and had been drilled to an aggregate depth of 2,291 feet, at a cost of ₱8,733.36.

In point of number of wells drilled, Cebu easily ranks first, with a total of 26 wells completed, 21 of which were successful and 5 unsuccessful; Bulacan comes second with 16 wells completed, all of which proved successful; and Pangasinan third, with 14 wells completed, 11 of which were successful and 3 unsuccessful.

The largest flowing wells which were successfully drilled this year were tapped in the following provinces:

	Depth in feet	Size of casing	Capacity in gallons per minute	Date completed
Pangasinan, Lingayen No. 13, Barrio Maniboc	637	6	150	Mar. 20, 1922.
Pangasinan San Carlos No. 7, Magallanes Street	420	4.5	150	Aug. 13, 1922.
Pangasinan, Calasiao No. 13, Barrio Nalsian	320	4.5	130	July 8, 1922.
Pangasinan, San Carlos No. 6, Market	425	6	100	July 1, 1922.
Bulacan, Baliwag No. 18, Barrio Makinabang	671	6	100	Nov. 25, 1922.
Batangas, Balayan No. 7, Paz Street	365	4.5	100	Sept. 23, 1922.

From January 1 to December 31, 1922, the Bureau Machine Shops completed 1,012 work orders, involving a total of ₱84,759.75, while during the previous year 1,047 work orders were completed, involving a total of ₱81,264.39. While a decrease of 35 work orders in comparison with that of last year is shown by the foregoing figures, yet the value of the work accomplished shows an increase of ₱3,495.36.

The Machine Shop performed 183 days of overtime work this year, in comparison with 49½ days in 1921, which shows an increase of 133½ days.

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year there were 1,598 new mortor vehicles registered and 11,808 re-registered, or a total of 13,406 as compared with 13,341 registered in the previous year. One thousand five hundred and thirty-three motor vehicles previously registered were withdrawn from operation, 497 of which were registered for storage only because of being unserviceable.

In the licensing of motor vehicle operators, 2,200 applicants were examined and 1,080 new licenses issued. Including renewals 17,939 drivers were licensed to operate motor vehicles.

The following will show the results of the campaign conducted during the year against unreliable chauffeurs:

Number of cases reported during first quarter	435
Number of cases reported during second quarter	170
Number of cases reported during third quarter	162
Number of cases reported during fourth quarter	124
Total	891

Number of deaths reported during the year		13
Number of speeding cases reported during first quarter		101
Number of speeding cases reported during second quarter		76
Number of speeding cases reported during third quarter		33
Number of speeding cases reported during fourth quarter		43
Total		253
Percentage of speeding cases during first quarter	Per cent	28
Percentage of speeding cases during second quarter	do	44
Percentage of speeding cases during third quarter	do	20
Percentage of speeding cases during fourth quarter	do	34
Number of licenses suspended during the year		163
Number of licenses revoked during the year		4
Total collection from fines during the year		₱19,323

Provisions of the Automobile Law most commonly violated

253 (speeding)	Section 26, Act 3045
213 (lights)	Section 24, Act 3045
120 (overloading)	Section 34, Act 3045
122 (driving without license)	Section 14 (*h*), Act 3045

COLLECTIONS AND EXPENDITURES

The following tabulation shows the amount of funds collected and expended under existing motor vehicle laws during 1922, as well as in previous year:

Year	Collections	Expenditures
1912	₱13,469.00	₱8,930.70
1913	19,882.66	19,630.72
1914	16,885.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,248.74	81,051.79
1919	118,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93

BENGUET AUTOMOBILE LINE

The Benguet Automobile Line operated during the year, 4 first-class truck busses, 2 third-class truck busses, 1 combined passenger and express truck, 1 fire truck, 2 express and freight trucks, 10 special touring cars, and 1 jitney for baggage delivery, and handled during the same period, 4,238 full-fare and 141 half-rate first-class passengers, 3,781 full-fare and 427 half-rate third-class passengers, 93,080 kilos of hand baggage, 712,159 kilos of express and freight, and 82,794 kilos of dead head express and freight. Its income was ₱112,916.40 and expenditures ₱88,707.55, or a total gain of ₱24,208.85.

THE USE OF THE BENGUET AND NAGUILIAN ROADS

Despite the financial crisis during the year the number of motor vehicles and sojourners that visited Baguio and passed over these two outlets of Baguio almost equalled that of last year and exceeded that of 1920. A comparative statement of traffic over these two roads for the last three years is given below:

Summary of traffic over the Benguet and Naguilian Roads

BENGUET ROAD

Year	Pedestrians	Bull carts	Animals led or ridden	Calesas	Motorcycles	Automobiles	Trucks	Wagons
1920	6,609	2,095	6,378	....	302	3,792	2,377	91
1921	20,666	10,831	6,668	1	606	4,728	3,390	85
1922	18,385	11,726	390	2	410	4,403	2,422	38

NAGUILIAN ROAD

1920	9,128	5,823	530	7	252	2,796	4,283	1,078
1921	15,725	11,052	1,908	40	275	3,704	7,785	55
1922	20,051	13,568	1,792	29	116	4,067	6,172	1,430

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Acting Chief Constructing Engineer*

ROADS

During the past year the larger part of the Bureau's activity has been along the lines of maintenance and reconstruction work. Four thousand nine hundred eighty-two and three-tenths kilometers of first-class, and 5,058.2 kilometers of second-class and third-class roads have been under maintenance, besides 4,607 kilometers of trail, which were under intermittent maintenance. Four million two hundred five thousand two hundred eighty-nine pesos and fifteen centavos was spent for the maintenance of first-class roads with an average cost of ₱820.14 per kilometer per annum. The cost varied from ₱2,508.50 in Sulu to ₱192.22 in the Mountain Province. This difference is due to amount of resurfacing done, traffic, class and availability of surfacing material, weather conditions, and labor. Following are tables showing average cost of maintenance per kilometer per annum since 1910, which is the first year in which such records were kept:

Roads in existence

Year	First-class designated	Second class	Third class	Total	Trails	Total expenditures on road and bridge work
	Kms.	*Kms.*	*Kms.*	*Kms.*	*Kms.*	
1910	916.6	1,344.8	3,337.6	5,599.0	([a])	₱5,290,736.84
1911	1,423.6	1,233.0	2,956.7	5,613.3	([a])	4,551,733.03
1912	1,780.3	2,219.3	3,216.7	7,216.3	([a])	4,546,708.14
1913	2,035.4	2,096.2	3,118.1	7,249.7	([a])	5,370,491.57
1914 (6 months)	2,171.6	2,086.8	3,138.7	7,397.1	378.4	3,680,435.09
1914	2,495.5	2,092.8	2,875.7	7,464.0	915.8	5,652,436.94
1915	3,064.0	2,085.9	3,051.7	8,201.6	518.2	5,872,056.81
1916	3,436.2	2,049.2	3,440.7	8,926.1	3,065.6	5,920,606.95
1917	3,738.7	2,056.6	3,393.6	9,188.9	3,929.6	6,148,213.45
1918	4,090.2	2,015.8	3,128.7	9,234.7	3,942.6	7,257,916.70
1919	4,500.3	1,986.0	3,109.2	9,595.5	3,892.4	8,966,011.55
1920	4,698.8	2,037.5	3,079.8	9,816.1	4,490.2	7,456,498.77
1921	4,836.4	2,044.8	3,036.6	9,977.8	4,414.9	7,177,644.24
1922	4,982.3	2,115.5	2,942.7	10,040.5	4,607.0	6,949,167.54

[a] No data.

Caminero system of maintenance

Year	Average kilometers maintained	Cost	Average cost per kilometer per year
1910	963.4	₱549,174.18	₱570.02
1911	1,441.7	709,369.72	492.02
1912	1,785.3	826,972.11	463.20
1913	1,976.3	1,096,854.29	555.00
1914 (6 months)	2,146.3	539,560.88	251.39
1914	2,317.6	1,098,082.54	473.80
1915	2,732.4	1,258,114.15	460.43
1916	3,226.8	1,642,404.93	508.98
1917	3,616.1	2,143,887.68	592.87
1918	4,023.4	2,756,810.70	685.19
1919	4,444.2	3,223,119.18	725.24
1920	4,601.3	3,197,202.28	694.85
1921	4,906.8	3,762,218.99	766.74
1922	5,127.5	4,205,289.25	820.14

Gang system of maintenance

Year	Average kilometers maintained	Cost	Average cost per kilometer per year
1910	([a])	([a])	([a])
1911	2,160.0	₱243,805.39	₱112.87
1912	2,339.0	334,706.84	143.00
1913	2,375.0	302,974.25	127.53
1914 (6 months)	1,700.0	170,652.37	100.45
1914	1,721.7	337,710.66	164.82
1915	2,692.2	396,930.57	147.44
1916	2,800.4	472,129.17	168.51
1917	3,057.0	560,258.92	183.27
1918	2,773.5	589,450.32	212.53
1919	3,152.5	696,440.38	220.92
1920	3,030.1	745,351.19	245.98
1921	3,200.3	746,102.24	233.14
1922	3,389.4	812,581.92	239.74

[a] No data.

Due to the reorganization of the Constructing Division of this Bureau into six engineering divisions, thus bringing the Central Office into closer touch with the field force, the maintenance work was greatly improved during the past year, but the greatest benefit maintenance received was the insistence on the policy that adequate provision for maintenance be made before appropriating any funds for construction purposes, and the withholding of Insular Aid from those provinces which failed to comply therewith. To this policy, and its vigorous support by the officials concerned, we owe, to a great extent, whatever successful results we have been able to accomplish during the past year. At this time last year there were some 80 odd kilometers of designated first-class road that were in a worse condition than most of the existing second- or third-class roads. In places they were actually impassable. The number of kilometers of these impassable roads would to-day be increased were it not for the stand taken by this Bureau as outlined above. Due to this maintenance policy there are now only 30 kilometers of designated first-class road that are not really first-class and these 30 kilometers will be brought back to standard by June 30th of this year. Too much emphasis cannot be laid upon the absolute necessity of the strict continuance of this policy upon which the existence of our first-class roads depends.

Owing to the fact that our road development has reached such a stage that provincial road and bridge revenues are not sufficient to properly maintain our present system of existing roads, very little construction was undertaken by this Bureau during 1922. In fact, most of the provinces are obliged to depend on Insular money to help out their provincial maintenance funds. To what extent this has become necessary is clearly shown by the following tabulation which gives the estimates for first-class maintenance for 1923, and the amounts of provincial funds available to meet same, together with their differences:

Province	Total provincial road and bridge funds	Provincial funds available for maintenance	Estimate for maintenance	Maintenance deficit	Available for construction
Abra	₱45,154.20	₱31,554.20	₱31,500.00	(₱54.20)	₱11,000.00
Agusan	32,011.56	26,000.00	26,000.00		
Albay-Catanduanes	137,819.00	108,435.25	187,311.00	78,875.75	
Antique	55,414.05	52,414.05	58,000.00	5,585.95	
Bataan	33,554.88	30,500.00	40,000.00	9,500.00	
Batangas	145,051.00	121,956.00	198,679.00	76,723.00	
Bohol	151,617.00	112,250.00	112,000.00	(250.00)	25,000.00
Bukidnon	12,810.40	11,800.00	60,000.00	48,200.00	
Bulacan	143,500.00	82,430.00	153,500.00	71,070.00	1,500.00
Cagayan	91,241.00	39,000.00	39,000.00		43,741.00
Camarines Norte	36,395.34	29,795.34	34,183.00	4,387.66	4,000.00
Camarines Sur	97,668.28	64,618.28	162,370.00	97,751.72	
Capiz	113,208.16	99,000.00	107,500.00	8,500.00	7,908.16
Cavite	64,445.32	57,445.32	107,000.00	49,554.68	
Cebu	317,541.52	250,000.00	429,800.00	179,800.00	
Cotabato	33,888.37	17,500.00	17,000.00	(500.00)	12,500.00
Davao	73,717.00	36,688.00	36,688.00		22,529.00
Ilocos Norte	87,917.16	82,000.00	97,000.00	15,000.00	
Ilocos Sur	155,500.00	117,000.00	123,000.00	6,000.00	18,864.00
Iloilo	213,000.00	190,400.00	243,400.00	53,000.00	10,000.00
Isabela	58,770.80	55,000.00	58,000.00	3,000.00	
Laguna	114,636.00	104,226.00	295,343.00	191,117.00	
Lanao	33,701.54	25,331.54	60,496.00	35,164.46	
La Union	82,213.08	57,000.00	75,000.00	18,000.00	15,000.00
Leyte	282,780.00	201,000.00	588,100.00	387,100.00	
Marinduque	38,033.00	28,051.00	28,051.00		7,632.00
Masbate	25,340.00	23,840.00	55,918.00	32,078.00	
Mindoro	32,800.00	24,500.00	24,500.00		7,300.00
Misamis	101,610.00	99,610.00	98,500.00	(1,110.00)	
Mountain Province	69,197.36	59,197.36	115,456.00	56,258.64	9,000.00
Nueva Ecija	157,920.00	125,000.00	125,000.00		9,000.00
Nueva Vizcaya	38,932.72	23,932.72	39,000.00	15,067.28	10,600.00
Occidental Negros	240,340.96	212,166.96	244,000.00	31,833.04	
Oriental Negros	91,660.00	80,720.00	80,720.00		
Palawan	46,113.28	14,113.28	13,900.00	(213.28)	
Pampanga	126,022.44	88,022.44	232,000.00	143,977.56	5,000.00
Pangasinan	321,904.08	237,654.08	330,000.00	92,345.92	
Rizal	128,354.00	74,470.00	101,000.00	26,530.00	23,330.00
Romblon	30,126.92	13,000.00	13,000.00		16,000.00
Samar	182,853.76	97,028.76	147,000.00	49,971.24	45,000.00
Sorsogon	55,859.44	50,759.44	128,576.00	77,816.56	
Sulu	45,741.36	27,343.20	27,343.20		3,556.80
Surigao	44,884.84	27,884.84	42,884.84	15,000.00	5,200.00
Tarlac	106,800.00	75,700.00	75,150.00	(550.00)	11,588.00
Tayabas	178,924.00	134,995.00	187,024.00	52,029.00	
(Revised)					
Zambales	38,453.98	30,539.25	36,500.00	5,960.75	
Zamboanga	74,654.20	65,000.00	65,000.00		
Total	4,790,062.00	3,616,872.31	5,551,393.04	1,934,520.73	325,648.96

NOTE.—It will be noted that in some instances amounts available for construction are shown altho a maintenance deficit exists. This is explained by the fact that such construction funds are either balances left over from previous Insular allotments or because it is incumbent to finish certain projects as soon as possible, or in order to take advantage of weather conditions by using provincial funds early in the year, replacing them later with Insular funds.

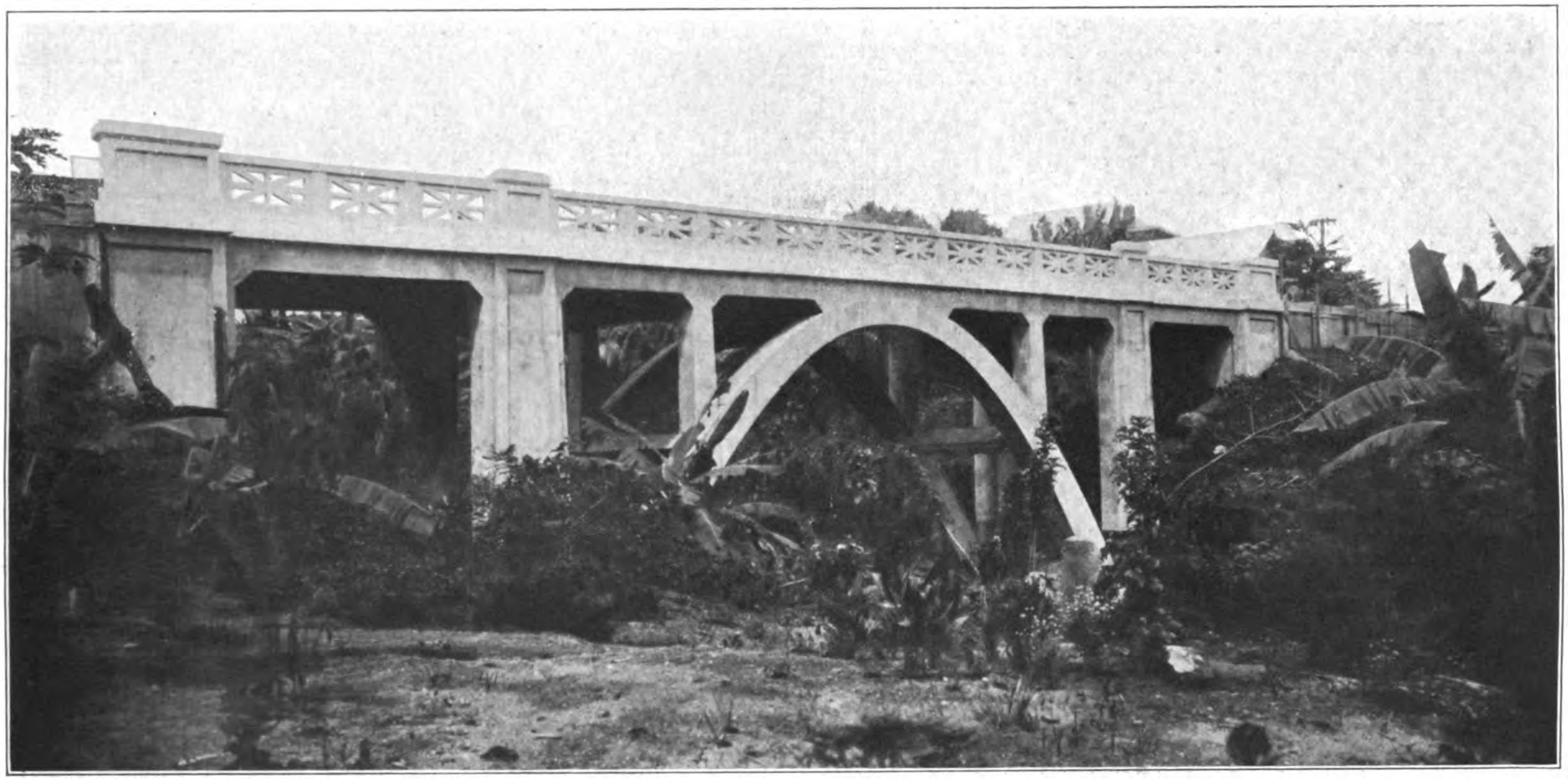
In addition to the above, ₱230,000 from Act 3044, paragraph 1, section (*i*-1) was made available by the Insular Government for the maintenance, reconstruction, and improvement of the Manila–North and South Roads traversing the Province of Rizal, parts of Bulacan, La Union, Laguna, and Nueva Ecija, including a portion of the Manila–Tarlac Road; the Zapote–Cavite Road, and the Pamplona–Pasacao Road.

In order to overcome this lack of construction funds a number of provinces have undertaken to issue bonds, as provided by Act 2894, as amended by Act 2950, to obtain money with which to finance the construction of new roads. This Bureau recommends approval of the issuance of such bonds subject to the following conditions:

1. That the plans, profiles, and specifications of the proposed roads and structures shall be approved by the Director of Public Works.
2. That the grade of the roads shall be placed above the flood level and shall be not less than 50 centimeters above the adjoining lands in case of roads located in the lowlands.
3. The provinces desiring to issue bonds shall comply with the provisions of section 2113 of Act 2711, and shall, by resolution of the Provincial Board, guarantee by continuing annual appropriations the establishment of such maintenance as may be necessary in the judgment of the Director of Public Works on all first-class roads now constructed and on all additional first-class roads which may be constructed in the future; provided, that if the amount appropriated for the maintenance of first-class roads is found insufficient, the province shall at the request of the Director of Public Works appropriate such additional amount as may be required for the proper maintenance of the said first-class roads.
4. That in case the Road and Bridge Fund revenue is not sufficient to cover the amount necessary for the proper maintenance of

Stretch of Sub-grade on the Indanan Silangkan and Parang Road, Sulu, P. I. Built by prison labor

Tuguegarao Alcala Road. Thirty-nine kilometers long. Cagayan, P. I.



Bañaderos Bridge, on the Manila South Road at kilometer 89.00, Laguna, P. I.

Total span, 33 meters. Completed in 1922. Cost ₱38,447

first-class roads, the province shall transfer from the General Funds to the Road and Bridge Funds the amount necessary to cover the deficit.

5. That the width of right-of-way of the metalled section, the thickness of metalling and kind of rock to be used thereon shall be as specified by this Bureau.

The following is a list, accompanied by short descriptions, of the more important roads upon which work has been done during the past year.

Construction of Aparri–Alcala Road. (Province of Cagayan.) During the past year 14 kilometers of the Aparri–Lallo section have been graded, and 8 kilometers surfaced. The Aparri–Camalaniugan section, 10 kilometers in length, has recently been declared first-class and opened to traffic. Preliminary and final location surveys of the Alcala–Lallo section have also been completed. This section is 43 kilometers long following a mountainous and rolling country and passes thru Alcala, Gattaran and Lallo, following the eastern bank of the Cagayan River.

Construction of Novcleta Tanza Road. (Province of Cavite.) The total length of this road is 8 kilometers, three and ninety-four hundreths (3.94) of which was completed as first-class during 1922. Crushed rock from Los Baños Quarry was used for the metalling which is 3 meters wide and 0.15 meters average thickness. When this road is completed it will connect the capital of the Province with the municipalities of Naic and Tanza. This project is financed wholly by the Insular Government, and the estimated cost is ₱230,000.

San Jose–Santa Fe Interprovincial Road. (Provinces of Nueva Ecija and Nueva Vizcaya.) This is a very important road which, when completed, will connect the rich provinces of the Cagayan Valley with those of Central Luzon. The length of this road is 58 kilometers of which 51 kilometers are in Nueva Ecija and 7 in Nueva Vizcaya.

Owing to the liberal allotment of ₱276,830.84 received early last year it was possible to complete the 11 kilometers from kilometer 175 to kilometer 186 with a surfaced section 2½ meters wide and a subgrade varying from 6 meters in width on level and rolling sections to 4 meters in width on mountain sections and also to construct a subgrade of 4 meters width to kilometer 203. It is expected that the subgrade will be completed to Santa Fe with the present allotment of ₱105,000. The Digdig Bridge, consisting of a 160-foot steel truss and two 8-meter span slab and girder approaches, supported on concrete piers, is also a part of this project and will cost ₱53,908 when completed.

Bayombong–San Luis Road. (Province of Nueva Vizcaya.) This road is a continuation of the proposed Cagayan Valley Road and is 46.3 kilometers in length, connecting the Provinces of Nueva Vizcaya and Isabela. During 1922, kilometers 35 and 36 were completed as first-class. This project, when completed, will facilitate the exportation of the Nueva Vizcaya products to the Provinces of Isabela and Cagayan.

Twenty-five thousand pesos was allotted late in 1922 for the continuation of work on this project and at the end of the year, the two kilometers completed made 34.2 kilometers of this road first-class, leaving only 12 kilometers to be completed when additional funds become available. The project involves a number of heavy cuts which renders it somewhat costly.

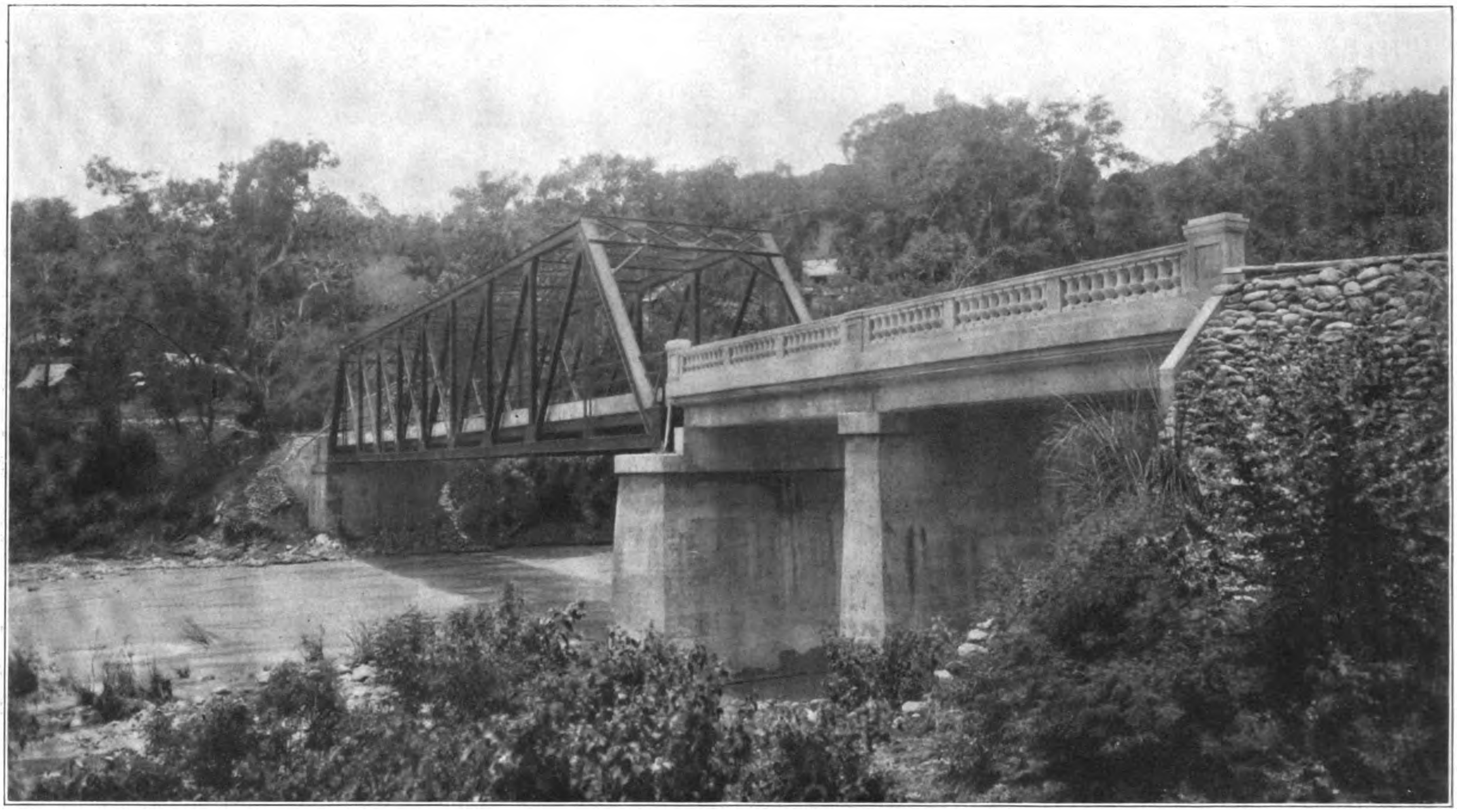
Construction of Lucban–Mauban Road. (Province of Tayabas.) This road is about 33 kilometers long and passes through Sampaloc, which is located 19 kilometers from Lucban and 14 kilometers from Mauban. During the past year 6.4 kilometers, of which the subgrade had been built in former years, were surfaced and declared first-class, and also the subgrade and first course of another kilometer were completed.

Construction of Loay–Interior Road. (Province of Bohol.) The Loay–Interior Road embraces all that route from Loay to the interior through the municipality of Carmen. The Carmen–Colonia Road, consisting of 12.5 kilometers, is a continuation of the Loay-Interior Road. Four kilometers of road were completed this year making a continuous first-class road up to kilometer 62, beyond which the grading has been completed for a distance of 500 meters. Rinderpest and unseasonable rains greatly retarded the work during the past year.

BRIDGES

The amount expended on the construction of permanent bridges during 1922 was curtailed to such an extent, due to scarcity of funds, that the total expenditure for permanent bridges amounted to only ₱490,662.39.

Following is a tabulated description of the bridges fully or partly completed during the past year:



Digdig Bridge, on the Digdig River, Santa Fé-San José Road, Nueva Ecija, P. I.

Total span, 66 meters. Completed in 1922. Cost ₱60,191

Important permanent bridges partially or completely constructed during the year 1922

Province and road	Name	Bridge and Km. No.—	Type	Span	Roadway on feet and meters	Percentage of work done	Total or partial cost
Batangas:							
Batangas-Nasugbu Road	Caong bridge	138.3	Old Spanish structure repaired, steel girder.	20.0 m.	4.88 m.	100	₱25,327.97
Bulacan:							
San Miguel-San Juan Road	San Miguel bridge	M. P.	Steel truss	132.4 ft.	14.0 ft.	55	26,533.48
Malolos-Hagonoy Road	Hagonoy bridge	M. P.	Concrete slab and girder on piles.	49.0 m.	4.88 m.	100	50,458.49
Camarines Norte:							
Daet-South Road	Daet bridge	1.0	Howe truss (timber)	50.0 ft.	2.83 m.	100	14,164.97
Cavite:							
Pasongkawayan-Quinta Road	Palubluban bridge	No number	Adobe stone, arch	10.8 m.	3.47 m.	100	18,087.72
Cebu:							
Cebu-South Road	Pandan bridge		(Reconstruction) steel truss, with 3 concrete slabs 7.0 m. each on pile bents.	142.0 ft.	4.27 m.	100	9,735.92
Ilocos Sur:							
Vigan-North Boundary Road	San Ildefonso bridge	453.4	Concrete slab and girder on concrete piles.	7.0 m.	4.88 m.	100	3,569.13
Iloilo:							
Iloilo-South Road	Overflow bridge		Concrete low overflow bridge	100.0 m.	4.88 m.	51	37,400.96
Laguna:							
Manila-South Road	Bañadero River bridge	88.97	Concrete arch with two concrete approach spans.	30.1 m.	4.88 m.	100	38,465.19
Mountain Province:							
Bontoc-Cervantes Road [a]	Sabangan bridge	466.8	Suspension	150 ft.	8.0 ft.	10	15,616.12
Nueva Ecija:							
San Jose-Santa Fe Int. Road [b]	Digdig bridge	183.3	Steel truss with two concrete approach spans.	212.48	4.88 m.	75	53,908.09
Occidental Negros:							
Bacolod-South Road	Diot River bridge	78.5	Concrete deck and girder on piles.	70.0 m.	4.88 m.	100	65,706.73
Oriental Negros:							
Dumaguete-South Road	Dumaguete bridge	1.2	Steel truss	150 ft.	7.0 m.	100	64,119.52
Pangasinan:							
Manila-North Road	Bued River bridge		Concrete slab and girder on concrete abutments.	11.0 m.	4.88 m.	100	12,295.04
Tayabas:							
Manila-South Road	Lagnas bridge	105.27	Steel truss with concrete floor on concrete abutments.	100 ft.	4.88 m.	60	35,904.65
Lopez-Calauag Road	Lopez bridge		Concrete slab and girder on piles.	2-7.0 m.	4.88 m.	100	19,368.50
			Grand total				₱490,662.39

[a] Most of expenditures were for materials.

[b] Cost of Digdig bridge included.

BUILDINGS

Manila.—The most important building project of the year was the continuance of work on the Legislative (Insular) Building. Contract was let to Mr. John Gordon for completion of the concrete work up to and including the second floor slab, amounting to about 4,000 cubic meters of concrete of all classes. The corresponding electrical work was let to Mr. A. G. Hillberg. Good progress was made on the project, and in spite of considerable difficulty, resulting in the changing of the contractor's foreman rather frequently, satisfactory work was secured. At the close of the year the contract work was fully 75 per cent complete.

The new Nurses Dormitory was completed by Messrs. Tan Samco and D. S. Clinton Company, under contract. Their workmanship and materials were very good throughout, and they are to be commended for their very evident desire to do a first-class job. The carpentry work is of the very best, and the structure, as a whole, bears evidence of unusually conscientious attention to selection of materials and labor supervision. This is a monumental, reinforced concrete, three-story structure, providing accommodations for about 200 nurses, with the entire ground floor devoted to lecture and assembly rooms. Its total cost was approximately ₱710,000, or about ₱31 per cubic meter of enclosed space. The contractor, at his expense, painted all concrete work, inside and out, with carbide residue, suitably tinted where necessary. This is in the nature of an experiment, as the material has not hitherto been used by the Government. If successful, the cost of painting Government buildings can be reduced below former figures.

A small fire-proof oil bodega was erected for the Bureau of Printing, under contract, by Mr. R. Agcaoili. The structure was incorporated in the proposed development of the permanent printing plant and greatly reduces the fire risk. The cost of the project was only ₱8,040.37.

The Post Office and Custom House projects were dormant throughout the year due to lack of funds. The exposed steel reinforcement has been carefully painted, with oil paint, to protect it against rust.

The addition to the Supreme Court (Arellano) Building was completed, under contract, by Mr. Carlos A. Barretto. The total cost of the project was ₱230,000. Mr. Barretto's contract amounted to only ₱30,226.70 as many materials were furnished him. The new offices and fire-proof document bodega constitute a valuable and pleasing addition to the old building and provide adequate housing for the Court. The workmanship of the contractor was satisfactory in every respect.

Mr. Jose G. Barretto was awarded the contract for installing partitions to fit up the Intendencia Building for the use of the Senate and the Treasury Bureau. The Electrical Section of this Bureau handled the corresponding electrical work. Mr. Barretto's contract amounted to ₱19,810.50 and the cost of the entire job was ₱50,000. The Intendencia Building is now one of the best office buildings owned by the Government and is as nearly fire-proof as it was possible to make an old Spanish structure. An "Hoffite" flooring was laid in the Office of the President of Senate, as a trial of the material. The cost was ₱8 per square meter. This material is a magnesia compound, possessing admirable qualities for hospital and similar use and, if its cost can be brought within reasonable limits, will solve a wide variety of flooring problems.

Maintenance, alteration, improvement, and repair of Insular buildings were also carried out, and a total of approximately ₱300,000 was expended on this work at Manila and its immediate vicinity, the remainder of the ₱450,000 appropriation being distributed to cover work of this nature on the various Insular buildings throughout the Islands.

A large amount of work was necessary to fit up the south bodega on the Port Area for the Customs and Quarantine Service Offices, and also to prepare the Old Aduana for the use of the Bureaus of Supply and Labor and the U. S. Veterans' Bureau local office. The total expenditures amounted to approximately ₱60,000 and the interchange appears to be entirely satisfactory.

Provinces.—The following is a description of the most important public buildings constructed in the provinces during 1922.

Cebu Normal School Building, Province of Cebu.—This building is being constructed in the municipality of Cebu, the capital of the province of the same name. It is a two-story reinforced concrete building consisting of the following: Front wing, 29.90 meters by 11.60 meters; main hall, 37.06 meters by 11.60 meters; and rear wing, 29.90 meters by 11.60 meters. The first floor contains 5 class rooms, 1 lecture room and 1 laboratory; and the second floor, 8 class rooms, 1 laboratory and 1 library room. The contractors, The Mas Construction Company, started work in February, 1922, and at the close of the year the project was 90 per cent complete, with a total expenditure of ₱218,706.30.

Iloilo Emergency Hospital Building, Province of Iloilo.—This building is located in the district of Mandurriao, municipality of Iloilo. It is a one-story wooden building, measuring 24 meters by 25.80 meters, enclosing an open court 8 meters by 10 meters. The footings are of concrete. It is roofed with corrugated galvanized iron and contains separate wards for male and female patients; one operating, one maternity, one dressing, one laboratory, one dispensary, one dining and one office rooms, with the necessary toilet facilities, kitchen and bath rooms. The work of construction was started in May, 1922, by contract, and, at the close of the year it was completed at a total cost of ₱36,169.87.

San Pablo Elementary School Building, Province of Laguna.—This is a Standard Plan No. 20, Pasig Type, one-story building, measuring 44.40 meters by 51.40 meters, but excluding the rear rooms. The foundation and walls are of concrete, the class and assembly room floors of wood, the porch and corridor floors of concrete and tiles, and the roof is of corrugated galvanized iron. The work of construction was started in October, 1921 by Mr. A. E. Haley, contractor, and the entire work was completed within the 210 days stipulated time and the building occupied by the school authorities in August, 1922. The building cost ₱87,419.40.

San Carlos Central School Building, Province of Pangasinan.—This is a one-story standard school building, Plan No. 20, measuring 42.40 meters by 51.30 meters with the four rear rooms ommitted. It provides for thirteen class, one assembly, one store, and one office rooms. The work of construction was started in January, 1922 and at the end of the year the building was completed at a total cost of ₱76,048.63.

Tayabas Court House, Province of Tayabas.—This is a two-story building, which was the old one-story reinforced concrete Trade School Building, remodelled by adding a wooden second story which measures 18.90 meters by 29.40 meters. The first story will house the Division Superintendent of Schools, Telephone Central and Post Office, while the second story will be occupied by the Court of First Instance, the Fiscal, the Clerk of Court and the Sheriff. The building is provided with two vaults for the use of the Fiscal and the Clerk of Court. The building was 95 per cent complete at the close of the year, with a total expenditure of ₱56,788.97.

Gumaca Presidencia Building, Province of Tayabas.—This is a standard plan of the Bureau of Public Works, now known as the "Gumaca" type of presidencia building. It is a two-story structure. The first story is made of concrete and measures 8.60 meters by 18.30 meters. The second story is built of wood and measures 10.30 meters by 20.0 meters. It is roofed with corrugated galvanized iron. The building was completed in October, 1922, at a total cost of ₱31,723.12.

Zamboanga General Hospital Operating Pavilion, Province of Zamboanga.—This is a one-story reinforced concrete building, measuring 9 meters by 20 meters. It has glass windows, wooden ceiling and partitions, and cement tile roof. The work of construction was started in August, 1920, but was suspended due to lack of funds. At the end of 1921 the building was 43 per cent complete. Work was resumed in July, 1922 and at the end of the year it was 97 per cent complete, with a total expenditure of ₱29,666.

Stringency of funds has affected the usual school, market, presidencia, hospital, and miscellaneous building construction in the provinces, with the result that only 106 permanent buildings were completed during 1922, as compared with a total of 148 in 1921. The following tables show by provinces and municipalities the number and types of buildings completed last year:

HOSPITAL

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions in meters	Contents (cu. m.)	Floor area (sq. m.)	Cost
Iloilo	Iloilo	1	Wood with G. I. Roof	24.00×25.80	4391	567	₱36,169.87

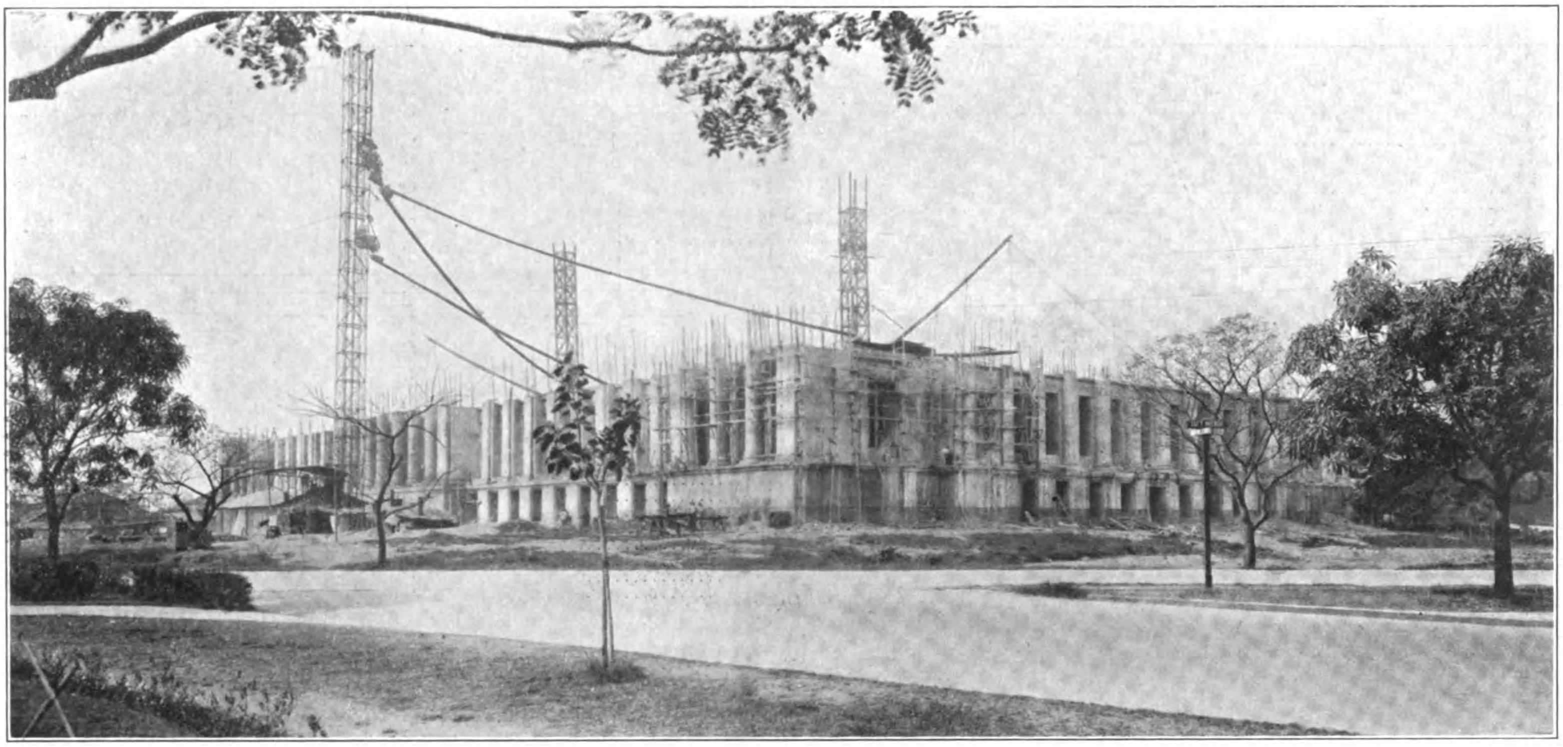
SCHOOL BUILDINGS

Province	Municipality	No. of buildings	Type and materials used	Principal dimentions in meters	Contents (cu. m.)	Cost
Albay	Tabaco	1	Concrete with G. I. roof Plan No. 10.	11.20×42.10×1-story	3,124	₱24,637.92
Antique	Dao	1	Wood—G. I. roof	7.20×11.95×1-story	605	2,960.85
Bataan	Balanga	1	Concrete with G. I. roof	11.80×14.00×1-story	1,290	8,649.05
Batangas	Lobo	1	Concrete with G. I. roof Plan No. 10.	39.20×28.40×1-story	4,529	39,553.08
Do.	San Carlos	1	Concrete with G. I. roof Plan No. 3.	9.20×23.20×1-story	1,439	18,747.85
Do.	Rosario	1	Concrete with G. I. roof Plan No. 3.	9.20×23.20×1-story	1,436	17,069.55
Do.	San Jose	1	Concrete with G. I. roof Plan No. 10.	21.20×29.20×1-story	4,116	38,379.54
Do.	Taal	1	Concrete with G. I. roof (7 additional rooms).	9.20×36.00×1-story	3,773	32,922.77
Bohol	Calape	1	Concrete with G. I. roof Plan No. 3.	9.20×23.20×1-story	1,436	12,957.57
Do.	Laboc	1	Stone roof (Second story)	11.00×25.00×1-story	1,600	12,188.06
Bulacan	Marilao	1	Wood—G. I. roof	10.25×27.70×1-story	1,274	13,500.00
Do.	Malolos	1	Wood—G. I. roof	11.20×42.10×1-story	3,124	33,207.37
Do.	Quingua	1	Wood—G. I. roof	9.20×28.80×1-story	1,962	11,592.00
Cagayan	Alcala	1	Concrete with G. I. roof Plan No. 10.	39.20×21.20×1-story	4,116	46,568.92
Do.	Tuguegarao	1	Concrete with G. I. roof Plan No. 20.	44.30×51.30×1-story	13,502	180,005.50
Capiz	Calivo	1	Concrete with G. I. roof Plan No. 20 (4 additional rooms).	11.80× 2-14.0×1-story	2,428	20,927.03
Cebu	Mandawe	1	Wood—G. I. roof	21.20×45.40×1-story	5,440	3,600.00
Iloilo	Iloilo	2	Wood—G. I. roof	10.00×11.00×1-story	1,140	5,968.73
Do.	La Paz	1	Concrete with G. I. roof Plan No. 5.	45.40×30.10×1-story	4,348	50,750.25
Do.	San Joaquin	1	Concrete with G. I. roof Plan No. 5.	12.10×45.40×1-story	3,271	25,513.86
Do.	Tigbauan	1	Concrete with G. I. roof Plan No. 5.	12.10×45.40×1-story	2,828	43,944.93
Isabela	Echague	1	Wood—G. I. roof	8.21×10.70×1-story	465	9,778.97
Laguna	Magdalena	1	Concrete with G. I. roof 3 additional rooms to Plan No. 7.	9.20×21.20×1-story	1,345	10,947.14
Do.	San Pablo	1	Concrete with G. I. roof Plan No. 20.	44.30×51.30×1-story	14,706	87,419.40
Leyte	Cabalian	1	Concrete with G. I. roof Plan No. 4.	9.20×32.20×1-story	1,881	14,060.17
Do.	San Miguel	1	Concrete with G. I. roof Plan No. 4.	9.20×32.20×1-story	1,881	18,000.00
Do.	Merida	1	Concrete with G. I. roof Plan No. 4.	9.20×32.20×1-story	1,881	16,260.00
Do.	Carigara	1	Concrete with G. I. roof Plan No. 10.	21.20×32.00×1-story	4,071	27,357.91
Marinduque	Santa Cruz	1	Concrete with G. I. roof Plan No. 5.	12.10×45.40×1-story	3,271	41,368.38
Mindoro	Calapan	1	Concrete with G. I. roof Plan No. 20.	15.90×51.30×1-story	6,227	74,149.69
Do.	Pola	1	Wood—G. I. roof	9.30×32.30×1-story	1,835	14,892.89
Do.	Mamburao	1	Wood—G. I. roof	9.30×32.30×1-story	1,835	13,316.53
Misamis	Cagayan	2	Concrete with G. I. roof Plan No. 3.	9.20×23.20×1-story	4,017	30,757.19
Occidental Negros	Talisay	1	Concrete with G. I. roof Plan No. 5.	45.40×21.20×1-story	4,578	38,673.32
Pampanga	Guagua	1	Concrete with G. I. roof Plan No. 6.	14.20×32.20×1-story	2,944	24,883.65
Pangasinan	Agno	1	Concrete with G. I. roof Plan No. 6.	14.20×32.20×1-story	2,966	21,080.10
Do.	Umingan	1	Concrete with G. I. roof Plan No. 5.	11.80×42.40×1-story	2,072	28,985.82
Do.	San Carlos	1	Concrete with G. I. roof Plan No. 20.	44.30×51.30×1-story	14,706	76,048.63
Do.	Asingan	1	Concrete with G. I. roof Plan	11.80×14.10×1-story	1,198	12,325.26
Do.	Bayambang	1	Concrete with G. I. roof Plan	11.20×17.50×1-story	1,250	17,075.43
Rizal	Tanay	1	Concrete with G. I. roof Plan No. 5.	12.10×45.40×1-story	3,105	29,648.86
Do.	San Felipe Neri	1	Wood—G. I. roof	9.15×32.15×1-story	2,156	10,346.82
Tarlac	Guevara	1	Concrete with G. I. roof Plan No. 3.	9.20×23.20×1-story	1,472	12,711.94
Do.	Tarlac	1	Concrete with G. I. roof (Pasig type).	44.30×51.30×1-story	12,851	175,693.75
Tayabas	Calauag	1	Concrete with G. I. roof Plan No. 7.	14.20×39.20×1-story	2,694	37,316.70
Do.	Guinayangan	1	Concrete with G. I. roof Plan No. 7.	14.20×39.20×1-story	3,459	32,160.00
Do.	Gumaca	1	Concrete with G. I. roof Plan No. 5.	21.20×45.40×1-story	3,875	51,683.61
Totals		49			169,519	1,570,586.99

In addition to the permanent school buildings listed above, the following temporary buildings were also constructed during the year:

TEMPORARY SCHOOL BUILDINGS

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions in meters	Contents (cu. m.)	Cost
Iloilo	Iloilo	1	Wood—nipa roof	41.00×36.00×1-story	4,689	7,781.46
Mindoro	Baco	1	Wood—nipa roof	8.30×15.30×1-story	879	3,749.92
Pangasinan	Lingayen	1	Wood—nipa roof	9.00×14.00×1-story	860	1,180.84
Do.	Bayambang	1	Wood—nipa roof	9.20×32.20×1-story	4,744	20,439.43
Do.	Lingayen	1	Wood—nipa roof	11.00×28.00×1-story	2,002	6,175.30
Samar	Pambujan	1	Wood—nipa roof	8.00×21.00×1-story	956	6,032.88
Do.	Mondragon	1	Wood—nipa roof	8.00×21.00×1-story	956	4,922.25
Totals		7			15,086	50,282.08



Legislative Building, Manila, P. I. Progress to January, 1923

(Two more stories to be added.) View of east and north sides

PRESIDENCIAS

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions in meters	Contents (cu. m.)	Floor area (sq. m.)	Cost
Batangas	Alitagtag	1	Wood and concrete with G. I. roof—2-story.	10.70×13.50	1,468	265	₱17,370.42
Benguet	Kapañgan	1	Masonry with G. I. roof—1-story	19.90×18.90	1,535	135	4,567.78
Isabela	Cauayan Centro	1	Concrete with G. I. roof—1-story	10.00×15.00	1,035	150	18,521.06
Mountain	Tinglayan	1	Brick with G. I. roof	7.10×16.30	813	116	9,931.75
Do.	Bontoc	1	Brick with G. I. roof	7.50×14.50	1,313	229	15,555.24
Nueva Ecija	San Jose	1	Wood and concrete with G. I. roof—2-story.	8.10×16.10	1,423	256	22,896.95
Oriental Negros	Sibulan	1	Wood and concrete with G. I. roof—2-story.	10.30×14.20	1,330	252	15,614.42
Do.	Libertad	1	Wood and concrete with 1-story	9.00×32.00	1,882	288	14,219.04
Pampanga	Angeles	1	Wood and concrete with 2-story	10.30×20.00	2,636	292	33,320.59
Tarlac	Pura	1	Wood and sawali, with 2-story	10.00×15.10	1,415	151	10,670.79
Do.	Moncada	1	Wood and sawali, with 2-story	8.10×16.10	1,454	130	17,325.11
Occidental Negros	Bacolod	1	Concrete and sawali, with 2-story	8.00×13.00	393	104	5,330.28
Tayabas	Gumaca	1	Wood and concrete with G . I. roof—2-story.	10.30×20.00	2,636	272	31,723.12
Totals		13			19,333	2,640	217,046.55

In addition to the permanent presidencia buildings listed above, the following temporary presidencia building was also constructed.

TEMPORARY PRESIDENCIA

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions in meters	Contents (cu. m.)	Floor area (sq. m.)	Cost
Mountain Province	Lubuagan	1	Wood with cogon roof	6.60×16.30	737	108	₱4,726.23

MARKET BUILDINGS AND TIENDAS

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions in meters	Contents (cu. m.)	Floor area (sq. m.)	Cost
Batangas	Calaca	1	Concrete with G. I. roof	5.20× 7.00	182	36	₱1,258.67
Bulacan	Baliwag	1	do.	30.0 ×43.50	...	1305	31,499.85
Do.	Bocaue	1	do.	27.0 ×15.0	...	415	16,342.45
Cagayan	Tuguegarao	1	do.	42.0 ×18.0	3275	756	29,021.27
Capiz	Pontevedra	1	do.	26.0 ×18.0	2796	468	16,520.29
Do.	Dumalag	1	do.	43.0 ×15.0	3573	645	19,541.99
Do.	Dao (Tiendas)	1	do.	8.35× 5.40	239	40	4,134.50
Cavite	Cavite (S.H.)	1	do.	8.90×12.20	416	109	6,584.17
Iloilo	Dumangas	1	do.	43.50×12.0	4000	914	30,172.06
Do.	Tigbauan	1	do.	39.0 ×15.0	2568	585	18,180.00
Do.	Jaro	1	do.	75.0 ×15.0	5039	1125	25,769.79
Laguna	Bay	1	do.	15.0 ×23.0	1788	345	10,969.18
Nueva Vizcaya	Solano	1	do.	12.0 ×21.0	931	252	6,644.60
Oriental Negros	Dumaguete	1	do.	8.9 ×12.20	468	109	3,072.09
Pampanga	Guagua	1	do.	8.9 ×12.20	526	109	5,362.61
Totals		15			25,801	7,213	225,073.52

MISCELLANEOUS BUILDINGS

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions in meters	Contents (cu. m.)	Floor area (sq. m.)	Cost
Batanes	Santo Domingo de Basco Wireless Station, Employee's quarters.	1	Concrete with G. I. roof	18.0 ×18.0	609	144	₱59,700.00
Do.	Operator's house	1	do.	6.0 × 8.0	271	48	
Do.	Store house	1	do.	4.0 × 6.0	107	24	
Do.	Power house	1	do.	6.0 × 8.0	276	48	
Bulacan	Malolos (jail)	1	do.	41.0 ×28.0	4,997	897	143,000.00
Davao	Davao (Constabulary barracks)	1	do.	11.0 ×45.16	3,492	690	45,683.52
Do.	Davao (lepers')	1	Wood with G. I. roof	4.5 ×12.0	260	54	3,047.14
Ilocos Sur	Vigan (Constabulary barracks)	1	Concrete with G. I. roof	11.0 ×45.16	3601	690	43,904.64
Manila	Dining and maternity pavilions	1	Concrete with tile roof	59.45×14.0	20,262	1,350	504,172.49
Do.	Rizal Hall University of the Philippines.	1	do.	24.4 ×51.0	18,342	1,761	602,829.25
Do.	Supreme Court	1	Concrete with G. I. roof	45.5 ×35.32	10,514	1,849	230,000.00
Do.	Oil bodega, Bureau of Printing	1	Concrete with concrete roof	13.0 ×67.0	468	105	8,342.42
Marinduque	Buenavista (bath house)	1	Concrete with G. I. roof	5.79× 6.18	128	36	4,988.97
Mountain	Baliwag (road house)	1	Wood with cogon roof	7.0 ×12.0	504	84	1,334.87
Do.	Payaoan (road house)	1	do.	8.0 × 9.0	431	72	288.11
Occidental Negros	Bacolod (Teachers' cottage)	1	Wood with G. I. roof	10.7 ×12.20	980	180	4,788.87
Rizal	Pasig (midden shed)	1	do.	3.2 × 5.20	60	17	2,883.58
Do.	Parañaque (midden shed)	1	Wood with G. I. roof	3.20× 4.70	60	15	2,399.92
Do.	do.	1	do.	3.10× 4.60	55	14	2,963.99
Do.	Montalban (midden shed)	1	do.	3.10× 4.60	55	14	2,696.28
Romblon	Romblon Wireless Station (employees' quarters).	1	do.	8.0 ×18.0	609	144	20,020.00
Do.	(Operator's house	1	do.	6.0 × 8.0	276	48	
Do.	(Store house)	1	do.	4.0 × 6.0	107	24	
Do.	(Power house)	1	do.	6.0 × 8.0	276	48	
Sulu	Siasi Wireless Station (employees' quarters).	1	do.	8.0 ×18.0	609	144	22,090.00
Do.	(Operator's house)	1	do.	6.0 × 8.0	276	48	
Do.	(Store house)	1	do.	4.0 × 6.0	107	24	
Do.	(Power house)	1	do.	6.0 × 8.0	276	48	
Do.	Cagayan Wireless Station, (employees' quarters).	1	do.	8.0 ×18.0	609	144	26,144.76
Do.	(Operator's house)	1	do.	6.0 × 8.0	276	48	
Do.	(Store house)	1	do.	4.0 × 6.0	107	24	
Do.	(Power house)	1	do.	6.0 × 8.0	276	48	
Tayabas	Lucena (Girls' dormitory)	1	Concrete with G. I. roof	11.0 ×31.40 10.00×11.35	4,451	459	86,533.03
Zamboanga	Normal School	1	Concrete with tile and G. I. roof	30.60×53.80	26,264	3,293	417,040.53
Totals					99,056	12,322	2,222,285.62

Table showing the number of durable buildings contsructed from 1909 to December 31, 1922, their cubical contents and cost

Year—	Number of buildings completed				Total number of all durable buildings	Total contents cubic meters	Per cent reinforced concrete by content	Expenditures on buildings completed, buildings under construction, also maintenance of buildings
	Schools	Markets and tiendas	Hospitals	All other durable buildings				
1909	15		2	20	37	(b)	(b)	₱1,921,284.63
1910				44	44	(b)	(b)	1,695,737.25
1911	56		10	92	158	206,368	64	2,923,351.32
1912	98	9	3	71	181	255,640	72	2,657,601.33
1913	88	15		41	144	409,025	85	1,864,666.67
1914 (a)	25	25		4	54	184,160	92	1,406,881.80
1914	69	51	1	15	136	370,723	92	2,703,485.94
1915	72	54	4	24	154	522,746	76	2,478,030.29
1916	67	17	1	27	112	261,496	85	2,046,243.43
1917	32	15	2	33	82	160,888	70	2,015,232.37
1918	27	19	2	36	84	220,943	56	2,706,443.65
1919	19	11	1	45	76	159,254	64	4,792,524.86
1920	47	12	3	20	82	229,653	65	5,925,042.45
1921	79	25	3	41	148	363,735	71	6,774,633.74
1922	49	15	1	41	106	317,870	88	4,271,162.55

[a] Six months only.

[b] No data.

PORT WORKS CONSTRUCTION AND IMPROVEMENT AND SEASHORE PROTECTION

Manila.—(See Designing Division's Report.)

Cagayan.—As described in last year's report, the work contemplated for the Aparri Seashore protection consists of the construction of eight (8) groins, with concrete piles and wooden sheathing, in accordance with the revised plans. The repair of Groin No. 1, which was reported 97 per cent complete, and again damaged last year, was completed. Groin No. 2 was started in the early part of the year, but work had to be suspended, when it was 40 per cent complete, due to lack of funds. The auxiliary groin was also completed by the middle of the year. The total project expenditure, at the end of the year, was ₱29,274.36. However, during a typhoon in September, 1922, Groin No. 1 was slightly damaged. An additional appropriation of ₱22,935.78 was released on November 21, 1922, and, as soon as the weather permits, work will be resumed.

Cavite.—The construction of the Cavite causeway seawall comprises the construction of a concrete wall, 3.10 meters in height, 1.50 meters at the base, and 0.65 meter at the top, resting on wooden piles, with a parabolic surface on the sea side to serve as a wave deflector. This structure replaces an old masonry wall protecting the causeway, which connects the barrio of San Roque with the walled city of Cavite. The work of construction was started by the Mas Construction Company of Manila in May and was completed in October, 1922, at a total cost of ₱33,690.54.

Cebu.—The reclamation of the Cebu Port Area, which involves the filling of the area behind the new wharf, was continued this year. The filling operation was carried on throughout the first three quarter of the year, using Dredge No. 4, and, at the close of the year, a total of 112,928 cubic meters of materials has been pumped into the area. It is estimated that 96,000 cubic meters of material are needed to complete the job. The total expenditure during the year was ₱81,676.88.

Davao.—The construction of the Davao Dock includes the erection of a wooden approach, 6.10 meters wide by 155 meters long, and a wooden pier head, 9.14 meters by 39 meters, on Pagatpat piles. The caps and stringers are of yacal, and the flooring is of pagatpat. The entire work was completed in May, 1922, at a total cost of ₱80,922.15.

Palawan.—The Puerto Princesa pier consists of an approach, 4.10 meters by 82 meters, and a pier head, 8.72 meters by 18.32 meters, on concrete piles with timber decking. The contract for supplying and driving all the concrete piles, for supplying and placing the timber caps including bolts and lug angles, and for placing the sway bracing, was awarded to the Cranston Engineering Company of Manila, for the sum of ₱45,450. At the end of 1922 the contractors had completed the driving of forty-five (45) 10-meter and twenty-seven (27) 12-meter piles, the supplying of 10" by 10" timber pile caps for the first nine (9) bents, and the supplying and placing of the sway bracing for same. The work accomplished represents 55 per cent of the entire project, which has been suspended pending additional allotment of funds.

Romblon.—This is a reinforced concrete deck-girder type wharf, 9 meters by 11.40 meters, resting on reinforced concrete piles. It replaces the old wooden wharf. The work acomplished this year consisted of the driving of the 20 piles required. The completion of this project will facilitate the loading and unloading of inter-island steamers at that port.

Zamboanga.—The dredging work in front of the wharf was completed in June, 1922, and, as a result, a depth of 25 feet at mean low water was secured. After this dredging operation, the working force and equipment were assigned to the repair of the wooden part of the wharf, which had been seriously attacked by teredos. In view of this, all other operations in connection with the improvement of the port were suspended. At the close of the year, 70 pagatpat piles had been driven and some 15,000 board feet of Yacal decking had been placed. Boring tests are being made for the purpose of obtaining correct subsoil data upon which to base the design for the proposed extension of the wharf. At present the wharf has an L-shape, and it is proposed to build an extension on the other side so that when the wharf is completed, it will have the shape of the letter T.

PORT WORKS MAINTENANCE

Dredging for maintenance and improvement of existing waterways was accomplished as set out in the attached tabulation. Considerable work was done for the Navy at Cavite by the S. S. *Dredger* in the course of which her ladder was damaged, but was repaired without expense to the Government. The S. S. *Dredger* was idle approximately 15 per cent of the usual working time, undergoing repair or the semi-annual docking and overhauling. This equipment is not in good condition.

Dredge No. 1 lost a large amount of time at Engineer Island undergoing repair of the top tumbler sprocket, etc. Dredge No. 2 (the other ladder dredge) was idle the entire year because of lack of scows. It will be docked and repaired early in 1923. These two dredges handle the maintenance of the Lower Pasig River and for their proper operation there should be five (5) self-dumping steel scows available, one of which would serve as reserve. We have at present one (1) new scow, built by the Atlantic Gulf and Pacific Company, and have contracted with the Earnshaws' Docks and Honolulu Iron Works for a duplicate. The only old scow still in service is in bad condition and it is probable that it cannot be economically repaired. Hence, it is obvious that three (3) more of these scows must be acquired. Similarly, the execution of estero dredging, even with Dredges Nos. 5 and 6 available, is possible only when the material can be given away or otherwise disposed of, as proper self-dumping scows are not possessed by the Government.

Dredge No. 3 was idle, waiting or undergoing repair, until late in the year, when it was assigned to Vitas Estero. This dredge is small and can only dredge to a depth of about 22 or 23 feet.

Dredge No. 4 continued in service on the reclamation work at Cebu until September, when it was transferred to Iloilo. Its performance at Iloilo, where it has averaged approximately 37,000 meters of excavation per month, at an average cost of ₱0.32 per cubic meter, shows conclusively that the conditions at Cebu are not favorable to the use of this type of dredge for making the required fill. In this connection, attention is invited to the fact that all of the excavated material at Iloilo is sold to private parties for filling.

Dredge No. 5 was laid up early in the year, and a new hull was built by contract with the Atlantic, Gulf and Pacific Co. At the close of the year, the dredge was at Engineer Island, where the machinery was averhauled and re-fitted.

Dredge No. 6 worked steadily throughout the year on estero work, except for a short time for docking and painting the hull. The dipper dredge is the most economical type, repair cost being very low and output high. It is probable that such a type of dredge, replacing the old ladder dredges (Nos. 1 and 2), would prove a decided economy.

Dredge No. 7 remained at Pasig, after overhauling and repair at Engineer Island, subsequent to a short period of rough work at Pier No. 7. It is utilized as a sand dredge, supplying Pier No. 7 and other administration projects in Manila with sand for concrete work.

The launch equipment of this Bureau is in very good condition, except possibly that the *Bohol* should have a new boiler and that a few of her ribs require renewal. The *Siasi*, new except for the engine and auxiliaries, is probably the best built launch of her kind and size in the Islands. The Varadero de Manila built the new hull under contract, and turned out an excellent job. It is safe to say that a better wooden hull cannot be built at any price. Enginner Island overhauled the engine and installed the new boiler and re-fitted the launch. The launch *Oeste* was received from Engineer Island and placed in service in May. She was practically rebuilt and is in excellent condition.

This Bureau has been compelled to use the launch *Ilocano* for light work in Manila, in lieu of the *Polaris*, which has been dismantled, the hull being beyond repair. Since it is evident that the *Polaris* cannot be rebuilt, at least for a long time to come, it is proposed that the *Ilocano* be acquired by transfer from the Bureau of Commerce and Industry. The launch *Negrito* has rendered general service and is in good condition.

Contract was let to the Varadero de Manila for the construction of launch *Resolute*, for which the Bureau will furnish the crude oil engine. This launch will be a heavy towing unit and should prove very economical.

Maintenance of Piers Nos. 3 and 5, the cargo sheds and the river walls and break-water entailed only routine work. The transfer of the stevedoring from the Customs to a private concern made little difference in the matter of maintenance. No fender piles were purchased, old piles being pulled and spliced when necessary. A few samples of the locally produced "treated" pile were purchased and driven at the Piers for test. They are supposed to be creosoted apitong, but it is probable that they are treated with tar.

The Office and bodega of the Pier maintenance force was rebuilt and the premises cleaned shortly before the close of the year.

The following tabulation indicates the scope of dredging work done from 1913 to 1922:

Dredging operation, 1913–1922

Locality	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
	Cu. m.	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*
Lower Pasig River	9,891	384,944	445,954	508,283	200,694	95,869	386,804	233,732	211,660	183,948
Outer harbor		300,889	348,568	508,510	468,513	215,617		354,715	280,402	164,354
Upper Pasig River		20,870	42,545	8,992	8,426	7,793	19,206	260,093	21,670	12,302
Inner basin		82,500		127,460	85,218	13,523				71,226
Binondo Canal		14,881								
Reina Estero	15,112		32,331	26,517	614			1,741		
Paco Estero					240	9,525	1,107	7,537	2,500	
San Miguel Estero	9,605	4,394		432	5,254	590	769	1,720		
Proviso Estero	2,492	4,283	3,315		6,596					
Marine Railway, Engineer Island				19,743			2,444			8,500
Outer bar		122,000	161,000	11,529	71,000	226,230	277,220	16,126	98,081	38,977
San Sebastian Estero							4,193			
Magdalena Estero				4,098	9,482					
Engineer Island Canal		2,802								
Vitas Estero	42,594		4,084			55,323	29,516		32,364	20,487
Quiapo Estero					6,784					
Balete Estero		12,533			6,797			2,993	1,956	2,345
Segado Estero	13,360	22,149								
Pandacan Estero	172									
Iloilo River	232,436	297,861	273,550	331,500	169,250	67,326	313,250		83,891	137,576
Cebu harbor	19,094	25,580	109,410		21,900	36,700	36,968	64,461	134,018	108,577
Mariquina River		7,290								
Estero de San Lazaro			3,213	19,762						
Corregidor Basin Quarter Master				54,956						
District of Cavite				20,876						
Tondo Beach					8,000	1,013				
Santibanez Estero					19,762			1,899		2,555
Tanque Estero						10,500	12,780		1,896	
Tacloban wharf						34,106	400			
Zamboanga						29,880				
Cotabato River						11,350	38,112			
Earnshaw's Slipways							2,208	23,905		7,000
Los Baños Pier								2,149		
Cañacao, Cavite								241,000		
Cavite, United States Navy									268,712	212,208
Concordia Estero										1,823
	398,937	1,302,976	1,423,970	1,642,658	1,033,530	815,346	1,124,977	1,212,051	1,132,150	971,878

WIRELESS STATIONS

In view of the very limited funds available for Radio Station construction, only the completion of some of the projects started in previous years was carried out during the year, as shown hereunder:

Province and station	Tower		Buildings (see also building reports)	
	Type	Remarks	Units constructed	Remarks
Romblon: Romblon	One 150-foot galvanized steel tower, Type E.	Completed in previous year, cost ₱10,799.77.	Operating house, power house, operator's quarters, and storehouse.	Completed November, 1922, cost ₱20,020 (approximate).
Cagayan de Sulu: Sulu	One 150-foot galvanized steel tower Type B.	Completed in previous year, cost ₱10,454.08.	Operating house, power house, operator's quarters, and storehouse.	Completed March 1922, cost ₱26,652.42.
Siasi: Sulu	One 150-foot galvanized steel tower, Type E.	Completed in previous year, cost ₱10,910.67.	Operating house, power house, operator's quarters, and store-house.	Completed December 31, 1922, cost ₱21,840.49.
Santo Domingo de Basco: Batanes	One 200-foot steel tower. (Extra heavy design.)	New tower to replace old one destroyed by typhoon. Completed December, 1922, cost ₱40,700.	Operating house, power house, operator's quarters, and store-house.	New buildings to replace those buildings destroyed by typhoon. Completed September, 1922, cost ₱59,700 (approximate).

TELEPHONE SYSTEM

In Cotabato Province, 13 kilometers of a new telephone line were completed connecting Colony No. 10 at Salunayan with Camp Ward Constabulary station at Midsayap, Bual. With this addition, a total of 342 kilometers of line have been established and maintained during the year. Also, materials for 16 kilometers of line to connect Mati with Kalamansing, Lebak, were requisitioned. A total of ₱3,935.39 was expended during the year.

In Davao Province the entire telephone line from Cuabo to Cateel, about 199 kilometers in length, was completed. This gives an additional length of 76 kilometers to the present system of 610 kilometers. With the completion of this line, the isolated municipalities of Baganga and Cateel are now brought into communication with Mati, a safe port in Davao Gulf, where there is a wireless station.

The telephone system in Nueva Vizcaya Province, consisting of 201 kilometers of lines, was satisfactorily maintained during the year in spite of the occurrence of several typhoons.

LIGHTHOUSE CONSTRUCTION AND REPAIR

Lighthouse construction and repair work was accomplished as set out in the following tabulation:

Station	Location	Nature of work	Cost
Lewis Lodge	Cebu	Repair steel ladder and cracks in concrete wall and floor.	₱3,840.44
San Nicolas	Cebu	Repair cracks in walls caused by recent earthquakes.	406.21
Luzaran	Guimaras Island	General repair of dwelling	5,327.73
Balabac	Balabac Harbor	do	7,203.96
Bagatao	Sorsogon Bay	do	7,146.73
Bolinao	Zambales	do	4,384.41
Pata	Northern Luzon	Repair of doors and windows and construction of fence and flag-pole.	5,495.05
Bago	Cebu	Construction of two concrete beacons.	4,174.37
Parang	Mindanao	Repair of wooden tower	748.56
Colorado	Northern Masbate	Repair of roof and gutter	684.98
Manigonigo	Island Northeastern Panay.	Repair of roof gutter and floor	922.95
Jintotolo	Jintotolo Island	General repair of dwelling	3,156.55
Cobrador	Romblon	Repair of roof	943.92
Linao	Northern Luzon	Repair of roof and windows	7,398.53
Engaño	Northeastern Luzon	General repair of dwelling	14,313.49
Napindan	Pasig River	Construction of one ladder	34.34
Batag	Samar	Supplying matrials	587.90
Cuyo	Palawan	Repair of dwelling, roof, doors, and windows.	2,256.14
Sula	Albay	Construction of wooden beacon.	524.73
Santa Cruz	Zamboanga	General repair of doors, roof, etc	955.99
Bongao	Sulu	Construction of tower	5,862.43
Mataja	Mindanao	Repair of roof, dwelling, doors, windows, etc.	2,075.30
Pasig River	Pasig River	Repair of roof	365.48
Bojeador	Northern Luzon	General repair of roof, dwelling, windows, and doors.	4,598.44
Subic Bay	Luzon	Repair, Fort Mills signal station	194.67
Zamboanga	Zamboanga	Repair of roof, windows, and dwelling.	133.29
Miscellaneous Lighthouses.		General repairs	9,531.46
Total			93,289.71

As can be readily seen, the total expenditures for lighthouse repair work executed by this Bureau amounted to ₱93,289; the balance of the appropriation was expended by the Bureau of Commerce and Industry on repairs of lamp mechanisms, automatic lights, buoys, etc.

DESIGNING DIVISION

E. C. Earle, *Chief Designing Engineer*

The continued downward trend of prices for building materials, both in the United States and locally, during the year, permitted of the preparation of plans for bridge and port works structures, with a view to the construction of a majority of same with permanent materials, such as reinforced concrete, rubble masonry, or structural steel.

Irrespective of the fact that the appropriation available for port works and bridge structure was greatly reduced in 1922, as compared with 1921, and the handicapped condition that the Division worked under due to the continued shortage of technical personnel, which has prevailed for the past three years, a considerable amount of works was accomplished and the more urgent demands for designs and installations of plants were cared for. The Division was unable, however, to prepare designs and estimates for many important projects and to make numerous studies and investigations of future work, due to the critical shortage of experienced technical personnel.

OFFICE

One of the outstanding and important features of the year's work consisted of the inauguration and standardization of a system of testing building materials. Simultaneously a campaign for the improvement of the quality of all concrete construction accomplished by, or for, the Insular Government was carried on. The results were more than gratifying and a very appreciable increase in the strength of concrete entering into bridge and building construction was obtained amounting in some cases to approximately 70 per cent over the previous records for similar work; the average increase being approximately 37 per cent. That this work might be brought to a successful issue, it was necessary to prepare complete instructions as regards the methods of taking samples and making tests of the various building materials and as regards the mixing and placing of concrete, all of which were embodied in Designing Division Circulars Nos. 3, 5, 6, and 8. As a further means of raising the standard of concrete construction, an exhaustive digest and study entitled "Better Concrete Being the Policy of the Bureau of Public Works" was prepared and placed in the hands of all Public Works engineers and employees responsible for work of this nature, for their guidance. Based upon the improved results obtained during the year, a completely revised set of specifications governing the construction of concrete structures was prepared under the supervision of the Designing Division. In line with this work and with a view to standardizing the methods of making "Soil Tests" for foundations and of improving the reliability of the results obtained, an extensive paper entitled "Soil Testing Apparatus" was prepared and given wide circulation among all Public Works engineers responsible for the making of such tests. The matter of securing better preservation of existing steel structures throughout the islands, likewise received especial attention and instructions were issued, in circular form, entitled "Field Painting of Structural Steel and Galvanized Iron" to all District Engineers.

A considerable amount of work was undertaken in connection with the compiling of data pertinent to all existing port works throughout the islands and in connection with the execution of development plans for the most important ports in the Archipelago. Inspections and investigations of the principal ports were made during the year.

Plans, specifications, and estimates were prepared, or studies and recommendations made, during the year for the bridge and port works projects, pumping and power plants, wireless stations, tanks, building, and other miscellaneous structures including floating equipment such as launches, scows, etc. as listed in Tables A to E.

TABLE A.—*Wireless towers and masts*

Project	Location	Type	Height	Remarks
Batanes Radio Station	Santo Domingo de Basco, Batanes.	Umbrella	200 feet	Extra heavy steel tower.
Calmay River Bridge	Pangasinan	Lattice pole	60 feet	Electric transmission lattice pole.

TABLE B.—*Bridges*

Province	Road	River	Type of structure	Remarks
Albay	Legaspi-Agus	Boranguit	R. C. girders	Length, 100 ft.
Capiz	Ivisan-Sigma	Mambasao	R. C. girders	Length, 135 ft.
Cavite	Dasmariñas-Paliparan.	Silang	I-beams	Length, 43 ft.
Cavite	Dasmariñas-Paliparan.	Silang	Suspension bridge.	Length, 80 ft.
Mountain	Tagudin-Bontoc	Sabangan	Suspension bridge.	Length, 150 ft.
Nueva Ecija	San Jose-Santa Fe.	Digdig	Steel truss and deck.	Length, 235 ft.

TABLE C.—*Port works*

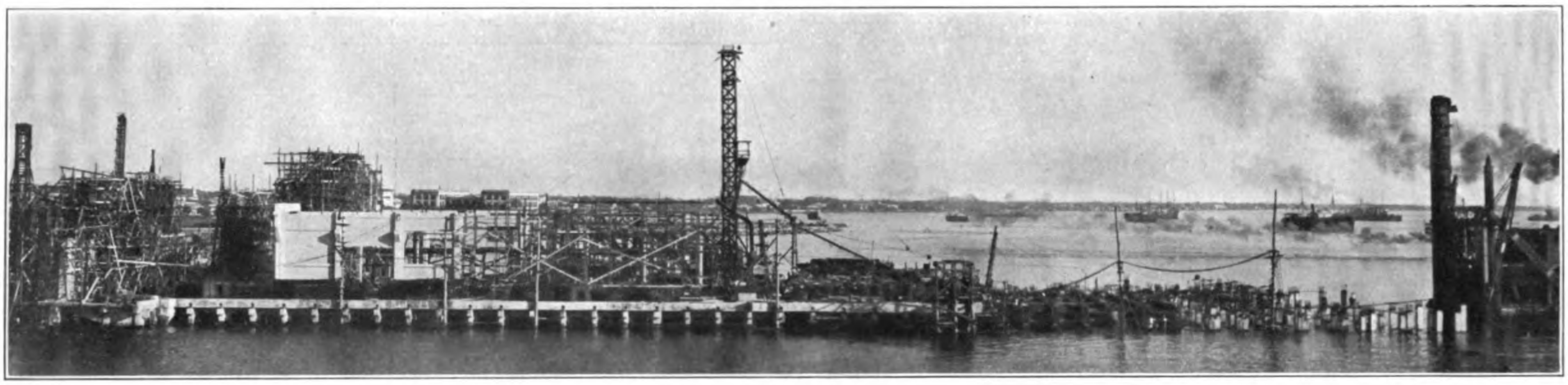
Province	Port	Type of structure	Remarks
Agusan	Butuan	Wharf	Combination timber and concrete. Plans and specifications.
Manila	Pasig River	Concrete river walls and quays.	Located between Santa Cruz bridge and Jones bridge on north and south banks. Plans and estimates.
Manila	Manila	Pier head No. 7	Foundations and floor system.

TABLE D.—*Electrical Installation and Power Plants*

Province	Location	Type	Remarks
Bulacan	Malolos	Pumping plant	Plans.
Bulacan	Malolos	do	Plans and specifications.
Benguet	Baguio	Hydro-electric plant	Plans and specifications for new high head plant.
Batangas	Batangas	Provincial capital electric plant.	Specifications and plans.
Batangas	Lemery	Electrical plant	Plans, specifications and contract.
Batangas	Batangas	do	Plans and specifications for new oil engine, contract.
Batangas	Batangas Provincial Government Building.	Wiring	Plans and specifications.
Cebu	Cebu Normal School	do	Plans, specifications and contract.
Cebu	Opon	Pumping plant	Plans and specifications.
Cavite	San Roque	Waterworks	Plans.
Misamis	Cagayan	Pumping plant	Repairs to plant.
Marinduque	Gasan	Waterworks	Repairs.
Manila	Maternity Ward, Philippine General Hospital.	Wiring	Interior plans.
Manila	Chemical Building, University of the Philippines.	do	Do.
Manila	Intendencia Building	do	Do.
Manila	Bureau of Printing Oil Bodega.	do	Plans, specifications and contract.
Manila	Nurses' Home, Philippine General Hospital.	do	Plans, contract and supervision.
Manila	Pier No. 7	do	Plans and partial installations of ducts.
Nueva Ecija	Cabanatuan	Pumping plant	Plans and contract.

TABLE E.—*Investigations, reports and recommendations*

Province	Location	Type	Remarks
Batangas	Taal	Electric light plant	Inspection and recommendations.
Bohol	Loboc Falls	Hydro-electric	Investigation and study.
Bohol	Tubigon	Waterworks	Investigations.
Bulacan	Baliuag	Electric light plant	Studies and investigations.
Laguna	Los Baños	Hydro-electric and waterworks.	Investigation and study.
Laguna	Santa Cruz	Firepump	Inspection and adjustment.
Mountain	Bontoc	Electric light plant	Inspection of plant.
Occidental Negros	Imbang River (near km. 19, Bacolod-Saravia Road).	River control project	Investigation and recommendations for dyking.
Sulu	Jolo	do	Studies and recommendations.
Tayabas	Sariaya	do	Inspection.



General View of Pier No. 7, Manila, P. I., under construction

FIELD

In the field a considerable amount of work was carried out by this Division during the year.

Crews were trained for calyx core drills and operations were conducted over a wide area on various bridge and port sites. The drills have proved very efficient and the accurate data pertaining to subsoil conditions made available through their operation has proven of great value to the bureau in connection with the preparation of designs and estimates for structures of all classes.

A large amount of work has been successfully carried on at the insular quarries, and has resulted in a decrease in cost of materials as well as the production of large quantities and an excellent quality of clean, well graded crushed rock. The work involved the installation of derricks, pumps, the relocation of conveyors, crushers, and screens and the installations of chain elevators from tram cars, as well as sluiceway for hydraulic sluicing. Rock drills and other similar equipment were installed to improve the efficiency of the quarry.

The construction of control works in the vicinity of the San Cristobal Bridge on the Manila North Road was successfully carried out during the months of July, August, and September. This protection work consisted principally of constructing heavy iron bound rock mattresses to protect the exposed footings of the South bridge abutment and the driving of timber sheet piling for a length of approximately 150 meters up stream. The sheet piling was restrained with heavy anchor rods and the entire area behind same was paved with rocks to a depth of approximately one meter, while a similar pavement was placed on the slopes of the bank to a depth of approximately fifty centimeters. During the progress of the work a flood occurred but as the work was already well advanced, practically no damage was done. Present indications are that the control of the river at this point has been successfully accomplished and aside from the necessity for the driving of concrete sheet piles at a future date to replace the existing timber sheet piles it is not anticipated that any heavy expenditures will be required in the fututre to maintain this bank protection.

A complete charging plant (Motor generator Type) was installed in the Port District (Manila) and put into service during the year. This plant is used for charging all of the batteries which operate the industrial trucks and tractors on the Manila Piers.

Ventilators and blowers for tunnel work were designed and installed at Bangar, La Union.

Electrical installations in the Insular Building at Manila, the Nurses' Home at the Philippine General Hospital, Manila, and the Batangas Provincial Building were supervised and repairs effected to the machinery of the Taal Electric Light and Pumping Plant.

At Zamboanga the shoal portions of the anchorage were dredged to a depth of 28 feet with an Orange Peel bucket. Much of the material removed consisted of large quantities of live coral. Prior to carrying out this work it was necessary to reconstruct and reequip an old derrick at that port. The work was completed within a period of approximately three months.

At Cebu dredging was discontinued and changes in the procedure of filling the new port area instituted. The Dredge America was taken from Cebu to Iloilo and dredging operations were started in the latter port during the month of September.

At Manila gratifying progress was made in connection with the construction of Pier No. 7, in spite of the considerable delay experienced in obtaining the release of any of the port works bond funds. The delay in the release of bonds considerably retarded the placing of orders for materials such as the steel sash, steel rolling doors, and the steel roof system for the superstructure. The steel for the roofiing system will not, therefore, be delivered in Manila before February or March, 1923, instead of as planned during August, 1922, while the steel sash will not be delivered until July. The steel rolling doors are due in June, 1923.

In spite of the difficulties resulting from the delay in releasing funds, it was possible to keep on with a considerable portion of the work for which materials of construction had been previously purchased. Approximately 37 per cent of the concrete superstructure (deck system) has been completed and about one-half of all pile driving operations finished, the majority of which work was carried on in the most difficult section of the project. The greater portion of the remaining driving operations will be conducted over more accessible area and will proceed at considerably increased rate. Approximately 96 per cent of all steel pile units have been fabricated and 68 per cent of all the concrete piles required have been cast. The remainder of the reinforcing steel needed, 30 per cent for the superstructure, will be delivered in Manila during the month of May, 1923. Approximately 48 per cent of all the timber piles required to support the foundation of Pier head No. 7 were driven and 22 per cent of the Pier head foundations placed; while the north arch dividing the Pier head from the Pier proper was 68 per cent completed at the end of the year. The first course of the building wall for the Head structure had also been placed by the end of the year. The program for this project contemplates the commissioning of one-half of the new pier—a structure more than twice the size of Pier No. 5,—during the latter part of 1923 and the completion of the entire structure in 1924.

DIVISION OF ARCHITECTURE

JUAN ARELLANO and TOMAS MAPUA, *Supervising Architects*

The volume of work accomplished by this Division is best indicated in the following tabulation of projects assigned to Messrs. Arellano and Mapua, respectively:

Projects assigned to Mr. Arellano showing status of each

Manila projects	Status
1. Insular Government Building	Additional story added to this building, plans being prepared. Revision of the front facade undertaken and a driveway incorporated for easy approach to the building.
2. Post-Office Building	The general and detail plans are nearing completion, also part of the full size details.
3. Lamp posts, Jones Bridge	Plans completed.
4. Harrison Park Development	Preliminary plans in preparation.
5. Interpretation of Burnham Plan in the vicinity of Padre Burgos and Plaza Lawton.	Plans completed.
PROVINCIAL PROJECTS	
1. Provincial Building and Grounds, Malolos, Bulacan.	Plans in preparation.
2. Mabini School, Batangas	Plans completed.
3. Rizal Park, Sariaya, Tayabas	Under study.
4. Provincial Building, Ilocos Sur	Drawings completed.
5. Provincial Building, Zambales	Drawings completed. Alteration under study.
6. Normal School, Iloilo	Plans completed.
7. Court Building, Tayabas	Plans completed. Minor details in preparation.
8. Rizal Memorial Park, Dapitan	Under study.
9. Post Office, Cebu	Preliminary plans completed.
10. High School, Del Pilar, Bulacan	Under study.
11. Hospital, Leyte	Plans for alteration completed.
12. Fountain, Placer, Surigao	Plans completed.
13. Layout and Improvement of Public Plazas, Camarines Sur.	Plans completed, except details of bandstands and benches.
14. Municipal School, Binmaley, Pangasinan	Plans completed.
15. Museum Hill Building, Zamboanga	Preliminary plans completed.
16. Monument, Pasonangka Park, Zamboanga	Plans in preparation.
17. Municipal Building, Pili, Camarines Sur	Plans completed, except full size details.
18. Tomas Claudio Memorial School, Morong, Rizal	Plans completed.
19. Provincial Park, Bacolod, Occidental Negros	Do.
20. Cottages for School Teachers and Principals	Do.
21. Annex, Navy Waiting Station	Do.
22. Layout of the Grounds of Caridad School No. 7, Cavite.	Do.
23. Monument, for Col. Lyman V. Kennen, Baguio	Do.
24. Villa Funeraria, Cebu	Under study.
25. Quarters for Light House Keepers (Standard)	Preliminary plans completed.
26. Municipal Building, Iriga, Camarines Sur	Full size details in preparation.

Projects assigned to Mr. Mapua showing status of each

Manila projects	Status
1. Pier head	Design for counter and scroon.
2. Customhouse	Revised part of working drawings and prepared a design for a new tower.
3. Nurses' Home, Philippines General Hospital	Full size details completed.
4. Intendencia Building	Revised third floor to accommodate Senate Offices.
5. South Bodega, Bureau of Supply	Plans for the alteration prepared and completed.
6. Laboratory extension, San Lazaro Hospital	Preliminary plans completed.
7. Communicable Diseases Ward, San Lazaro Hospital.	Preliminary plans completed.
8. Insane Pavilion, San Lazaro Hospital	Preliminary plans completed.
9. Leper Cottage, San Lazaro Hospital	Do.
10. Executive Building	Plans for enclosing the second floor verandas.
11. Old Maternity Pavilion, Philippine General Hospital.	Preliminary plans for the alteration.
12. Addition to the Central School	Preliminary plans prepared.
13. Offices, Pier Head No. 4	Do.
14. Supreme Court Building	Plans for the alteration of steps, plans of book shelves completed.
15. Chemistry Laboratory, University of the Philippines.	Equipment plan completed.
16. Chemistry Pavilion, Philippine General Hospital	Preliminary plans prepared for converting same into laborers' quarters.
17. Lecture Room and Laboratory, Philippine General Hospital.	Preliminary plans prepared for the alteration of the old dormitory building.
18. Pier No. 7	Plans and details of the front elevation completed.
19. Case, Governor-General's, Office	Preliminary plans completed.
20. Training Department, Normal School	Do.
21. Pavilion for Laboratory and Surgery, University of the Philippines.	Do.
22. Animal House, University of Philippines	Do.
23. Treasury Vault, Corregidor	Plans for iron grille doors prepared.
PROVINCIAL PROJECTS	
1. Municipal Building, Camalig, Albay	Location plan.
2. Radio Station, Santo Domingo de Basco, Batanes	Working drawings completed.
3. Bodega, Radio Station, Batangas	Do.
4. Plaridel Bridge, Hagonoy, Bulacan	Name plate.
5. Municipal Building, Clarin, Bohol	Working drawings completed.
6. Municipal Building, Talisay, Camarines Norte	Preliminary plans prepared.
7. Municipal Building, Baao, Camarines Sur	Location plan completed.
8. High School, Capiz, Capiz	Do.
PROVINCIAL PROJECTS—continued	
9. Nurses' Home, Southern Islands Hospital, Cebu	Preliminary plans prepared for a temporary wooden building.
10. Addition, second story wing, Southern Islands Hospital, Cebu.	Preliminary plans prepared.
11. Boloc Boloc Spring, Cebu	Development plan prepared.
12. Leper Hospital, Careta, Cebu	Preliminary plans prepared.
13. Addition, Provincial Building, Cebu	Structural drawings completed.
14. Hagubiao Springs, Mandawe, Cebu	Developement plan prepared.
15. Extension, two wings. Southern Islands Hospital, Cebu.	Preliminary plans and estimate prepared.
16. Radio Station, Glan, Cotabato	Location plan completed.
17. Bungalows, Culion Leper Colony	Working drawings completed.
18. Chemical Pavilion, Leper Colony	Do.
19. Treatment Pavilion, Leper Colony	Do.
20. Dormitory Buildings, Culion, Leper Colony	Do.
21. Bachelors' Quarters, Culion Leper Colony	Do
22. Two-apartment House, Culion Leper Colony	Do.
23. Four-apartment House, Culion Leper Colony	Do.
24. Administration Building, Culion Leper Colony	Preliminary plans prepared.
25. Hospital and Clinic, Culion Leper Colony	Do.
26. Storage Building, Culion Leper Colony	Do.
27. Mess Hall for Colonists, Culion Leper Colony	Do.
28. Kitchen, Culion Leper Colony	Do.
29. Dormitories, Culion Leper Colony	Do.
30. Hospital Building, Mati, Davao	Do.
31. Provincial Building, Laoag, Ilocos Norte	Design wrot iron grilles.
32. Emergency Hospital, Manduriao, Iloilo	Location plan completed.
33. Municipal Building, Iloilo	Name plate.
34. Band Stand, La Paz, Iloilo	Preliminary plans prepared.
35. Addition to Provincial Building, San Fernando, La Union.	Working drawings prepared and completed.
36. Municipal Building, Initao, Cagayan, Misamis	Preliminary plans prepared.
37. Municipal Building, Bontoc, Mountain Province	Location plan completed.
38. Addition to Prison, Cabanatuan Nueva Ecija	Working plans prepared and completed.
39. Municipal Building, Los Angeles, Pampanga	Location plan completed.
40. Municipal Building, Magalang, Pampanga	Working drawings for the portico prepared and completed.
41. Municipal Building, Muntinlupa, Rizal	Working drawings completed.
42. Municipal Building, Cainta, Rizal	Standard plans prepared.
43. Municipal Building, Pasay, Rizal	Preliminary plans prepared.
44. Dormitories, Schools and Wards, Culion Leper Colony, San Pedro Macati, Rizal.	Do.
45. Provincial Building, Samar	Working drawings being prepared.
46. Provincial Hospitals	Preliminary plans prepared for several types of wood and concrete buildings.
47. Talulong Bridge, Tayabas	Name plate.
48. Bath-house, Pansol, Los Baños, Laguna	Preliminary plans prepared.

Owing to the many municipal requests during the year for municipal buildings, it was found necessary to prepare plans for several new types of these buildings designed for different materials and of varied costs. The problem has been satisfactorily solved, as most municipalities were able to build within their appropriations, which in most cases were quite small. Likewise, opportunities were offered to prapare drawings for Mineral bath houses, which benefit, to a certain extent, a large population. The development of drawings for standard types of Provincial hospitals was undertaken. Likewise, drawings for several types of semi-permanent types of schools, based upon the drawings of the Bureau of Education, were undertaken in the interests of the educational programme of the Government. It was found necessary to revise the specifications for all types of permanent concrete types of school buildings, for the reason that the standards for materials have changed during the past ten years or more.

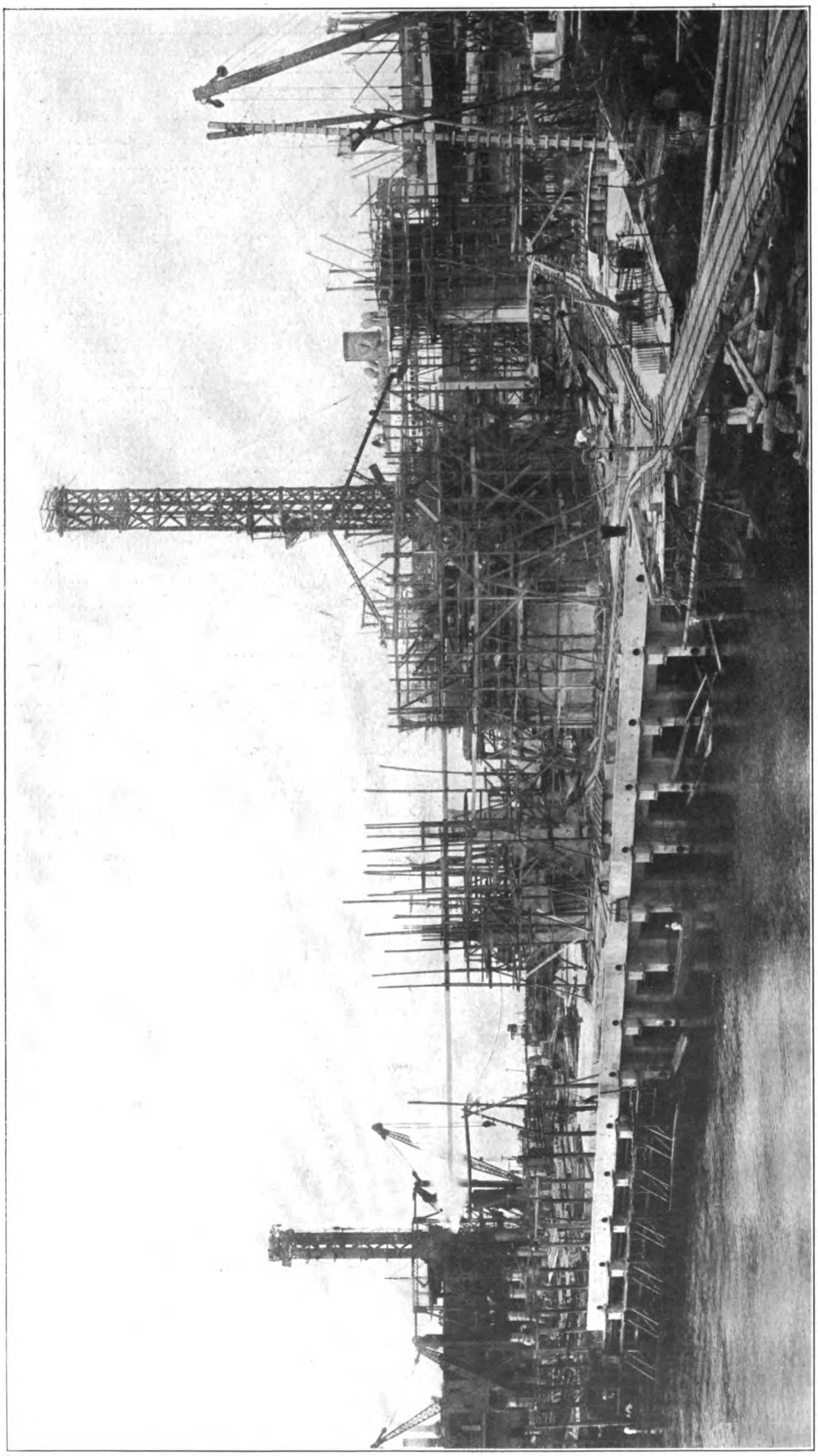
The policy of the beautification of town plazas has been continued wherever it has been found possible. The several Insular projects in Manila, such as the Insular Government Building, the Office and the Custom House have not been fully carried out, but it is believed that these buildings will be a creditable showing as to architectural merits.

IRRIGATION DIVISION

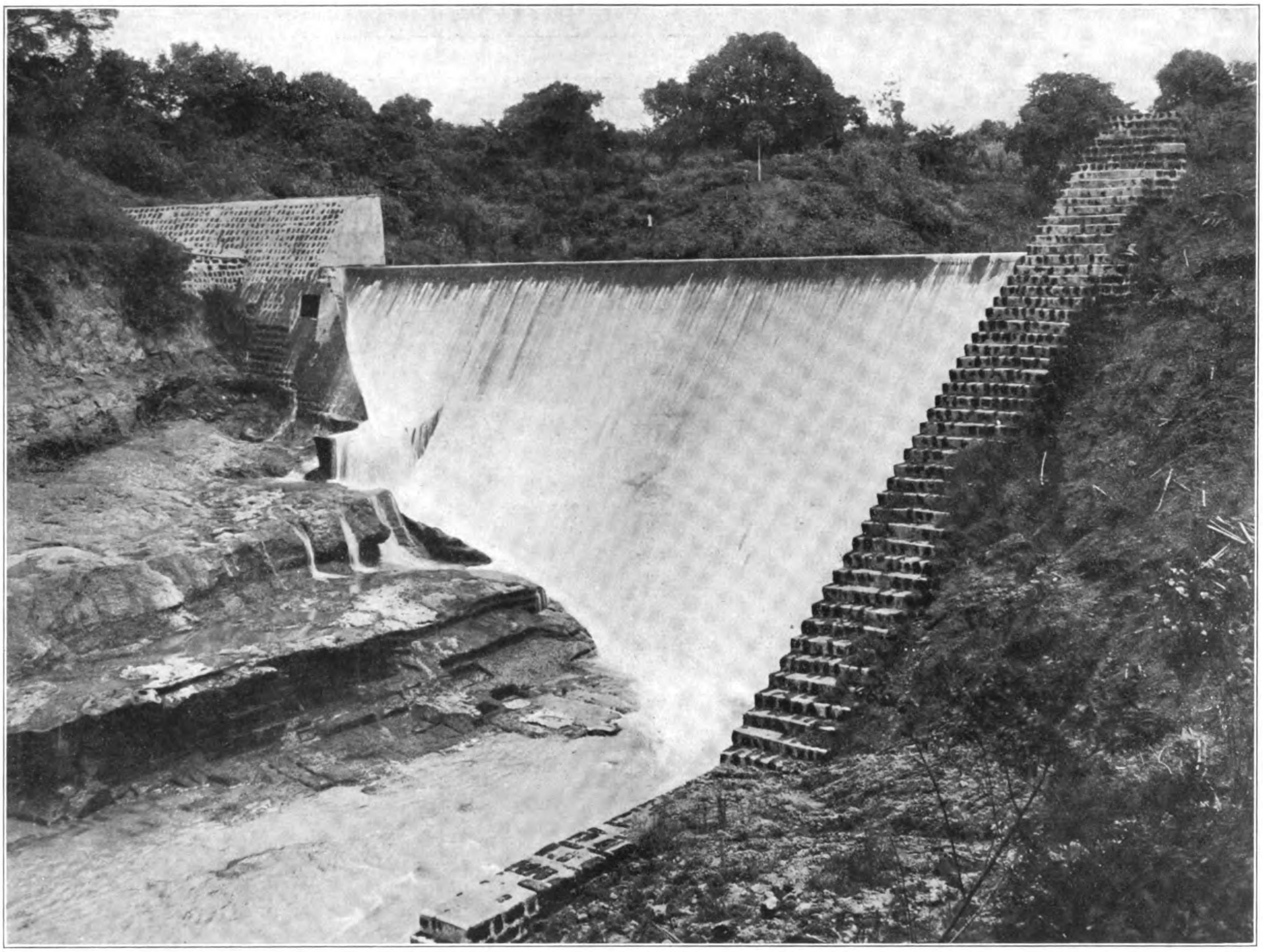
A. D. WILLIAMS, *Chief Irrigation Engineer*

INSULAR IRRIGATION PROJECTS

The irrigation construction program which had been delayed during the latter part of 1921 and the first part of 1922, due to the policy of retrenchment adopted by the Government, was actively



Pier No. 7, Manila, P. I. Close view showing supports for fender system

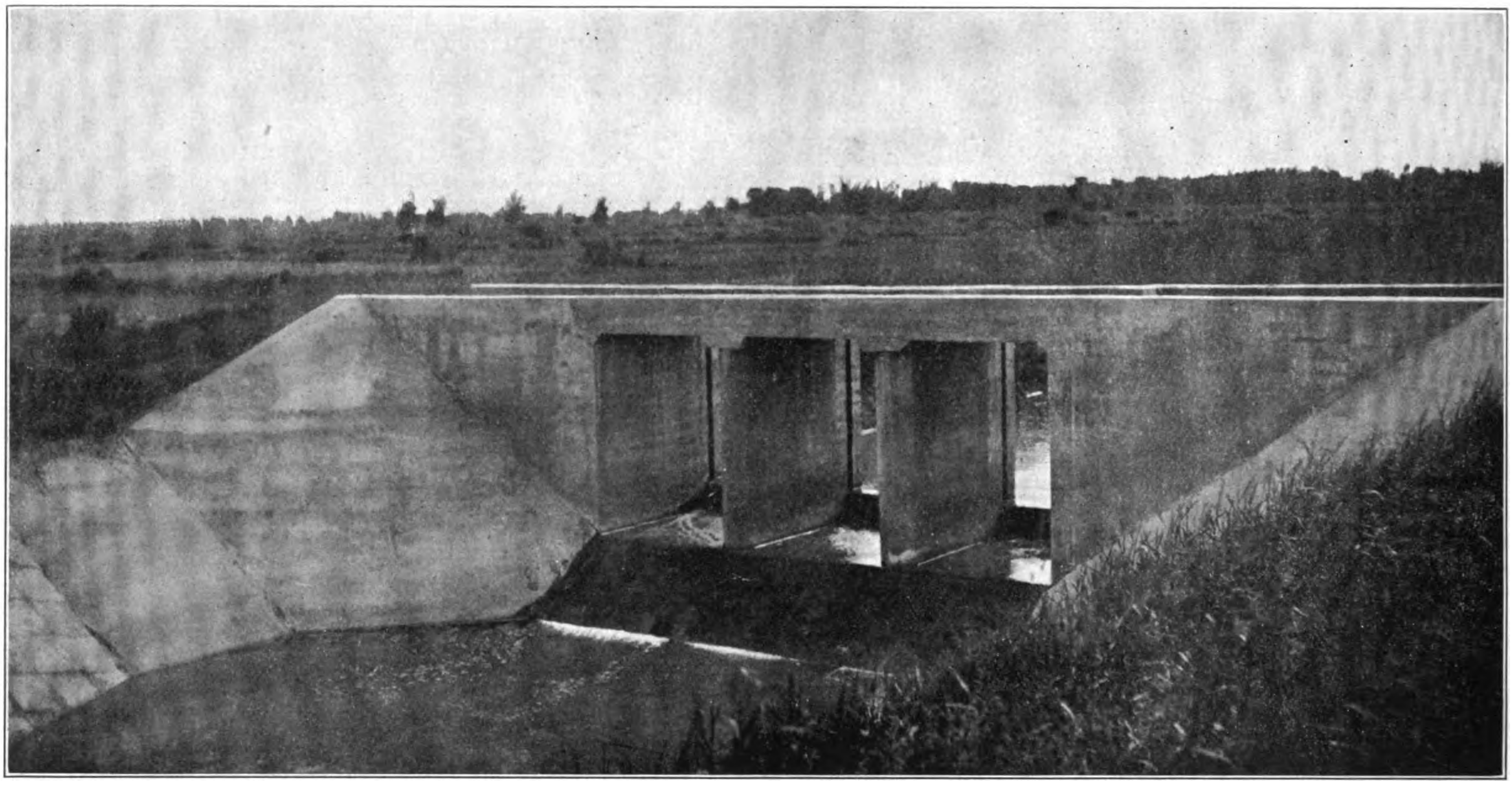


Down stream view, Naic diversion dam, Cavite Province, P. I.

resumed in April, 1922, upon the release of bond issue funds appropriated by Act 3011, entitled "An Act to appropriate the sum of twenty million pesos for the construction of irrigation systems." Funds totaling ₱2,300,000 were provided in April for continuing construction work on projects actually under way. Further allotments, amounting to ₱1,140,000, were authorized from the same source and for the same purpose in September, making the total of funds provided during the year, ₱3,440,000. This enabled the Division to complete the Santa Barbara project in Iloilo Province and the Dingras project in Ilocos Norte, and also to make very satisfactory progress on the construction of other projects previously authorized. The status of all insular irrigation projects which have been approved for construction since the reorganization of the Division in 1918 is given in the following table:

Project	Province	Irrigable area	Estimated cost	Allotments authorized	Total expenses and liabilities	Percentage of work completed
		Hectares				
Trinidad	Mountain	200	₱40,000	₱40,000	₱40,000	Completed (1921).
Santa Barbara	Iloilo	4,986	692,000	692,000	692,000	Completed (1922).
Dingras	Ilocos Norte	1,010	130,000	130,000	130,000	Completed (1922).
Baruyen River	do.	1,000	85,000	81,000	80,292	97 per cent.
Naic	Cavite	800	300,000	300,000	268,396	92 per cent.
Aganao River	Iloilo	5,500	917,000	917,000	754,765	50 per cent.
Talavera River	Nueva Ecija	10,000	1,028,000	1,028,000	823,312	80 per cent.
Tagudin	Ilocos Sur	1,300	300,000	250,000	162,062	37 per cent.
Amburayan River	La Union	4,500	750,000	619,000	432,347	40 per cent.
Angat River	Bulacan	25,000	4,500,000	2,250,000	2,232,438	22 per cent.
Lamao	Bataan	160	30,000	5,000	3,627	2 per cent.
Laoag-Vintar	Ilocos Norte	6,000	1,000,000	300,000	25,736	1 per cent.
Total		60,456	9,772,000	6,612,000	5,644,975	

Trinidad Irrigation Project.—This project was completed in January, 1921, and a brief description of same given in the report of this Division for the year 1921. The larger part of the land irrigated by the system is owned by the Trinidad Farm School and, upon completion, the system was turned over to the Superintendent of the school for operation and maintenance, in accordance with special authority granted by the Secretary of Commerce and Communications in approving the project for construction.



Combination bull cart crossing and drop, main canal, Aganao river irrigation system, Iloilo, P. I.

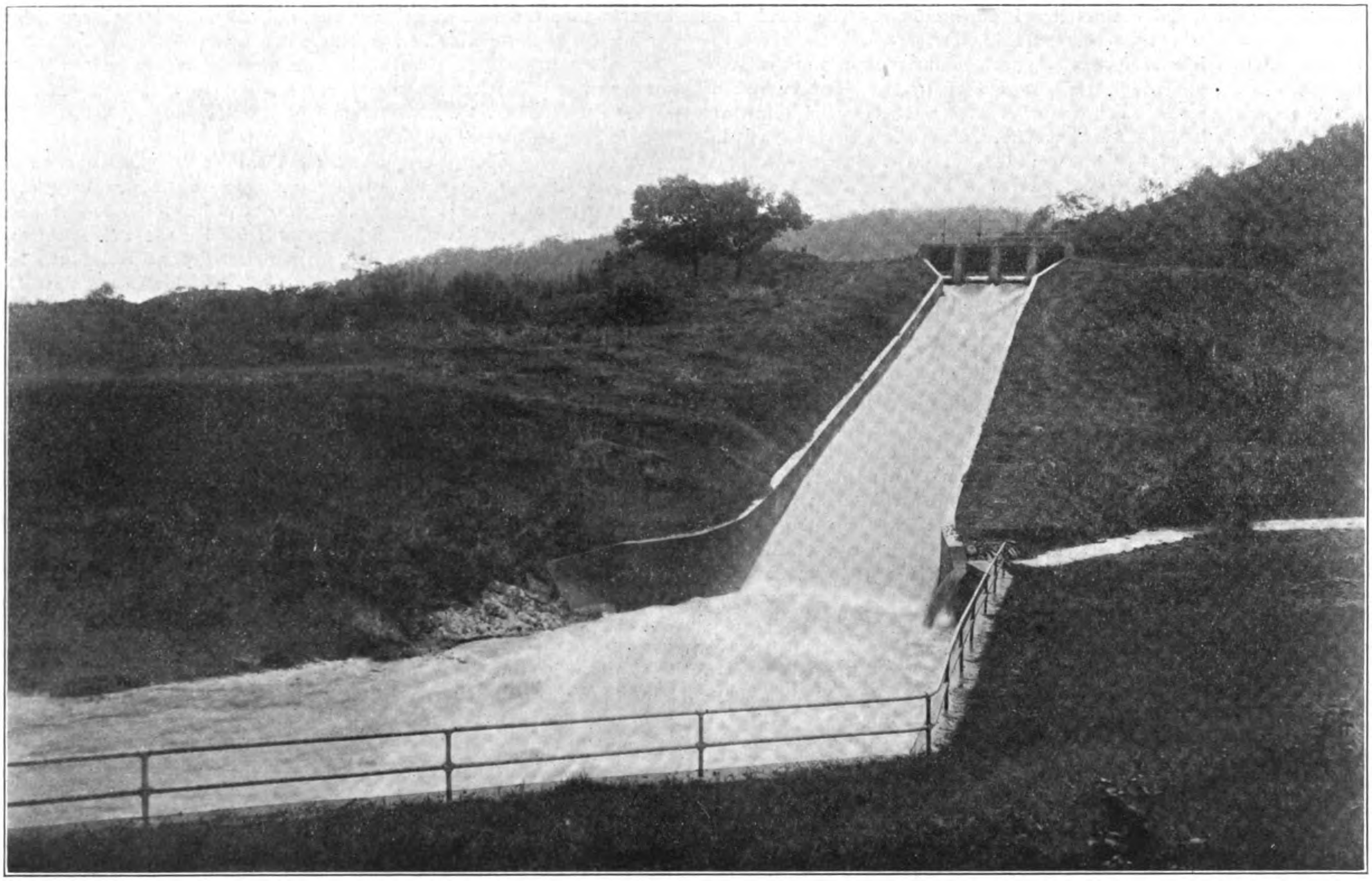
Santa Barbara Irrigation Project.—Construction work on this project was completed in June, 1922, and water was furnished to landowners under the system for the 1922 rice crop. It was necessary, however, to delay the official opening of the system to December 1, 1922, on account of the work involved in the preparation of a complete list of water users giving the area of irrigable land held by each. The list as prepared shows that the system benefits 733 landowners, or 1,746 separate parcels of land with a total area of 4,985.82 hectares. The irrigation notice covering the completion of the project provides that the annual charge per hectare on said land to cover the costs of construction with interest shall be ₱7.01 and that same shall be paid in forty equal annual payments due on or before March first of each year. The estimated annual cost of maintenance and operation is ₱2 per hectare, making the total annual charges approximately ₱9 per hectare. That the payment of these charges represents an excellent investment for the landowners was well demonstrated by the 1922 rice crop produced under the system. While actual figures are not yet available, it is safe to say that the yield of rice under the system was fully fifty per cent higher than on unirrigated land in this locality.

Dingras Irrigation Project.—Construction work was completed on this project in December, 1922, but water was made available for practically the entire tract of irrigable land in July, 1922, and an excellent crop of rice was harvested. The official opening of the system was held on January first, 1923. There are 2,312 water users under the system who own 5,440 separate parcels of land containing a total area of 1,009.47 hectares. The annual charge per hectare on this land to cover the cost of construction with interest is ₱6.50 and the estimated annual cost of maintenance and operation, ₱2.50 per hectare, making the total annual charges approximately ₱9 per hectare. Payments are to be made by landowners in forty annual installments due on or before March first of each year.

Baruyen River Irrigation Project.—This project, including a cadastral survey of the irrigable land and the preparation of a list of water users, was practically completed at the end of the year. The work remaining unfinished consisted of lining a section of the main canal to prevent the loss of water through seepage and the construction of a small lateral canal. It is expected that this system can be officially opened in March, 1923. The final estimate of cost of ₱85,000 exceeds the original estimate by ₱4,000, due to the necessity for lining portions of the main canal.

Naic Irrigation Project.—Construction work on this project was taken over by administration from the Manila Engineering Co., the contractors for the masonry dam and canal excavation work, on May 8, 1922, due to unsatifactory progress. Three extensions of time amounting to 288 days had been authorized for the completion of the dam and two extensions, totaling 161 days, for the canal axcavation work, making May 31, 1922, the time for completing both contracts. At the time of taking over the work, it was estimated that the dam was approximately 80 per cent completed, not including necessary extra work, and the canal excavation work was about 45 per cent completed. It was therefore apparent that the contractors could not complete the work in contract time. It was desired to complete the dam before the heavy rains started, but an early rainy season made it advisable to discontinue construction work on the dam early in July, after the work had been carried by administration to the point where it could be safely left through the rainy season. Construction work on the dam was resumed in November and same should be completed in February, 1923. The canal excavation work and the construction of all canal structures were completed before the end of the year. The system should therefore be ready to deliver water for the next rice crop.

Aganao River Irrigation Project.—The canal excavation work which was performed under contract with the Manila Engineering Co. was completed in October, 1922, they having been granted an extension of time of 70 working days in accordance with the terms of the contract. The diversion works, which are being constructed under contract with the Atlantic, Gulf and Pacific Co. of Manila, were approximately 50 per cent complete at the end of the year, and at the present very satisfactory rate of progress, the diversion works



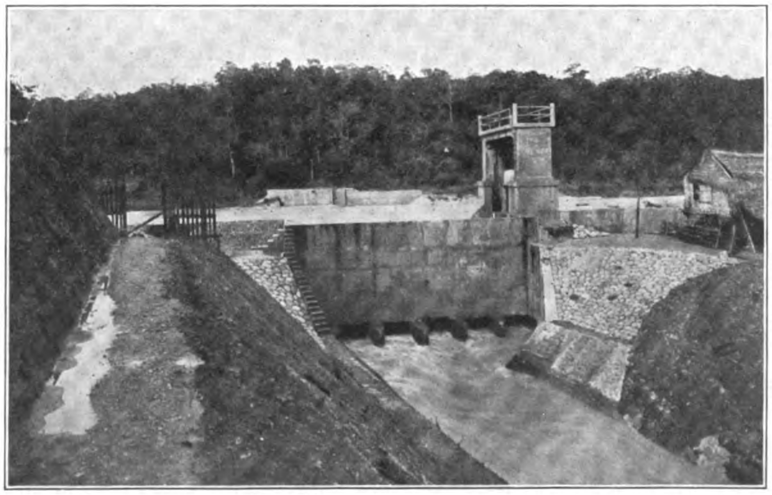
Chute at 15-meter fall, main canal, Talavera river irrigation system

(Site of Proposed Power Plant) Nueva Ecija, P. I.

should be completed in April, 1923. The plans of all canal structures were completed and this Bureau advertised for bids in December with a view to completing the entire system in time to furnish water for the 1923 rice crop.

Talavera River Irrigation Project.—Messrs. Martin and Hanna, contractors for the constrution of the diversion works and main canal structures, completed all canal structures on contract time, June 30, 1922, but an early rainy season seriously interfered with work on the diversion weir and it was necessary to continue work on same through the rainy season. Extensions of time totaling 90 working days were authorized and the work finally completed and accepted on December 30, 1922. The main canal and a portion of the distribution system having been finished in July, the contractors were required to make provision for diverting water for irrigating approximately 4,000 hectares of land planted to rice during the past season. With the release of ₱228,000 required for the completion of this project in September, 1922, the work of completing the distribution system was immediately resumed. It is believed that this work can be finished in time to furnish water to the entire area of 10,000 hectares for the next rice crop and for the official opening of the system by the end of 1923.

Tagudin Irrigation Project.—The work of driving the 1,300-meter diversion tunnel was resumed by administration with the release of funds in May, 1922, all construction work on this project having been shut down in August, 1921, because of lack of funds. Delays on account of the necessity for lining sections of the completed tunnel and from handling the large amount of water encountered during the rainy season interfered with the work of driving the tunnel. Very satisfactory progress was made, however, after the rainy season and it is now planned to complete the project as a whole during the 1924 dry season. A total of 670 lineal meters of the tunnel had been driven at the end of the year, of which 270 meters



Diversion works, Talavera river irrigation system, Nueva Ecija, P. I.

were driven and 126 meters lined during 1922. The headworks structure is also about 80 per cent complete.

Amburayan River Irrigation Project.—Construction work on this project, which had been delayed from August, 1921, due to lack of funds, was resumed by administration with the release of additional funds in April, 1922. The work accomplished during the year included the driving of 390 lineal meters of the 750-meter diversion tunnel, excavating 48,000 cubic meters of material from a 5- to 7-meter cut on the main canal, placing 392.5 cubic meters of rubble masonry and concrete in main canal structures and laying 6,450 square meters of rubble paving in the main canal. The work of driving the tunnel is progressing very satisfactorily and should be completed during the present dry season. The main canal including the paving work and the construction of the distribution system will require at least another dry season for completion.

Angat River Irrigation Project.—The Atlantic, Gulf and Pacific Co., of Manila, contractors for the excavation of the south side canal system made very satisfactory progress during 1922 and it is thought that this work will be completed approximately on contract time or, in any case, during the present dry season. Three drag-line excavators and two large derricks have been used in excavating the main canal and a large force of labor employed on the smaller canals. The work remaining to be finished at the end of the year was largely confined to the first kilometer of the main canal which is in deep cut, involving considerable rock work.

The contract for the construction of the diversion works was awarded to Mr. J. B. Findley, of Manila in April, but the early rains, which started in May and a late rainy season, prevented the contractor from accomplishing any work on the diversion weir proper other than excavating material above the normal water level. Considerable work, however, was performed on the construction of both the north and south side headgates and scouring sluices, which were successfully protected from floods. The delay in getting work started on the diversion weir means that the contractor is probably limited to one short dry season for completing the contract, or will have to take the risk of holding uncompleted work in a large river during the rainy season, since the contract time expires the latter part of August, 1923. The work remaining to be finished involves the pouring of approximately 20,000 cubic meters of concrete and a large amount of wet excavation.

The preparation of plans of canal structures for the south side system was practically completed at the end of the year and additional funds were requested with a view to starting construction work early in 1923. It will probably require from one to one and a-half years to complete all canal structures for the south side system, which serves 15,000 hectares, but it is expected that water can be furnished to a portion of the land for the 1923 rice crop. Present plans contemplate starting the construction of the north side system in 1924 and completing the project as a whole in 1925.

Lamao Experiment Station Irrigation Project.—The construction of this project was discontinued in August, 1921, and ₱25,000 of the ₱30,000 appropriation reverted by the Emergency Board to the Insular Treasury. This being a special project for the Bureau of Agriculture, bond issue funds have not been provided for completing same. It is proposed to resume construction work as soon as additional funds can be made available.

Laoag-Vintar Irrigation Project.—This project was approved for construction in 1921 but it was necessary to delay construction work until bond issue funds were released in September, 1922. Bids for canal excavation work were opened in December, 1922, and a contract was awarded for this work to Mr. Sotero Baluyot, of Pampanga, at very satisfactory prices. The contract provides that this work shall be completed by June 1st, 1924. Funds have been requested for starting the construction of the diversion works and it is expected to complete this project in 1924.

OPERATION AND MAINTENANCE

The following table gives the area irrigated and the financial status of insular irrigation systems operated and maintained by the Division:

Name of system	Province	Cost	Irrigable area	Area irrigated, 1922	Cost of operation and maintenance, 1922	Total water charges, 1922	Remarks
			Hectares	*Hectares*			
Pilar	Bataan	₱25,000	200.00	176.72	₱1,616.54	₱3,071.45	Completed in 1912.
San Miguel	Tarlac	1,089,000	4,000.00	2,248.00	12,527.67	15,241.00	Completed in 1913.
Santa Barbara	Iloilo	692,000	4,985.82	4,985.82	[a] 786.53	[b] 3,774.26	System officially opened December 1, 1922.
Total		1,806,000	9,185.82	7,410.54	14,930.74	22,086.71	

[a] Cost for December, 1922.

[b] Charges for December only.

The San Miguel Irrigation System is operated and maintained by the Government in accordance with the terms of contracts with the *Compañía General de Tabacos de Filipinas*, the owner of all the land served by the system, while the Pilar and Santa Barbara Systems were operated and maintained under the provisions of the Irrigation Act.

Considerable maintenance and repair work was also performed on the following Friar Lands irrigation systems which are administered by the Bureau of Lands:

Name	Estate	Province
Legidero System	Santa Cruz de Malabon	Cavite.
Matanda System	do.	Do.
San Cristobal System	Calamba Estate	Laguna.

MUNICIPAL IRRIGATION PROJECTS

The following table gives the status of all municipal irrigation projects which have approved for construction under the provisions of Act 2755:

Project	Province	Irrigable area	Cost		Remarks
			Insular	Municipal	
		Hectares			
Santa Maria	Zamboanga	431	₱16,000	₱7,000	Completed 1920.
Ayala	do.	183	11,500	5,500	Completed 1922.
Dipolog	do.	1,000	37,500	14,000	50 per cent completed.
Total		1,614	65,000	26,500	

The Santa Maria and Ayala Systems, upon completion, were turned over to the municipality of Zamboanga for administration as provided for in Act 2755. Construction work on the Dipolog project was discontinued by the District Engineer in June, 1921, due to lack of funds and no work was accomplished during 1922 on account of the inability of the municipality of Dipolog to provide funds for financing the completion of the work. Upon the request of the municipal council of Dipolog and the Provincial Board of Zamboanga Province, this project was approved for completion as an insular project, under the provision of Act 2152, in December, 1922. Irrigation notices are being served on the interested landowners and if no protests are received, construction work can be resumed in May, 1923. The revised estimate of cost is ₱115,000.

IRRIGATION PROJECTS UNDER CONSIDERATION

The following list gives the location, irrigable area, and status of important irrigation projects under consideration:

Province	Project	Irrigable area	Status
		Ha.	
Albay	Quinale Lake Bato	6,000	Awaiting investigation.
Do	Malinao–Tabaco	600	Do.
Camarines Norte	Daet	2,000	Topographic survey completed.
Do	Talisay–Indan	3,000	Do.
Camarines Sur	San Jose–Hagonoy	5,000	Awaiting investigation.
Do	Pauili Valley	5,000	Topographic survey completed.
Do	Barit River	2,000	Awaiting investigation.
Antique	Sibalom	3,800	Topographic survey completed.
Bataan	Dinalupijan	2,500	Awaiting ivestigation.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
Do	Mambusao	1,000	Preliminary investigation 1911.
Do	Macato–Malinao	1,200	Do.
Do	Ibahay	500	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Preliminary investigation 1910.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
Do	Candon	3,000	Topographic survey completed.
Do	Santa Cruz	1,000	Preliminary survey completed.
Batangas	Batangas	1,000	Investigation in progress.
Do	Balayan	300	Do.
Do	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Topographic survey completed.
Do	Pototan	2,300	Survey and preliminary design made.
Do	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Topographic survey completed.
La Union	Balaoan	1,200	Survey and plans completed.
Do	Bacnotan	2,000	Topographic survey completed.
La Union	Agoo–Tubao	2,000	Awaiting investigation.
Do	Naguilian	1,000	Preliminary survey completed.
Do	Rosario	1,000	Topographic survey completed.
Do	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	1,000	Topographic survey completed.
Do	Dagami–Tanauan	14,000	Awaiting investigation.
Do	Dato–Hilongos	3,500	Do.
Nueva Ecija	Pampanga River	25,000	Topographic survey practically completed.
Do	Peñaranda	17,500	Topographic survey completed.
Nueva Vizcaya	Murong	1,200	Do.
Occidental Negros	Binalbagan–Himamaylan	3,000	Do.
Do	Bago	20,000	Topographic survey in progress.
Do	Silay Projection	5,000	Awaiting investigation.
Oriental Negros	La Granja Exporting Station.	200	Investigation in progress.
Do	Tanjay	800	Awaiting investigation.
Do	Tolong	3,000	Preliminary investigation completed.
Pampanga	Porac River	1,000	Topographic survey completed.
Do	Bamban	3,000	Do.
Do	Gumain	5,000	Do.
Pangasinan	Agno	30,000	Topographic survey in progress.
Do	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do	San Fabian	4,000	Recommended for construction, Act 2755.
Rizal	Mariquina Valley	5,000	Topographic survey completed.
Do	Pililla	180	Recommended for construction, Act 2755.
Do	Morong	580	Recommended for construction, Act 2755.
Tarlac	Capas	5,000	Topographic survey completed.
Do	Tarlac	30,000	Awaiting investigation.
Zambales	San Marcelino	5,000	Topographic survey completed.
Do	Toton–Lanom	600	Do.
Do	Iba	400	Do.
Total		319,530	

Topographic surveys were completed during 1922 of the Candon project, in Ilocos Sur, and the Santa Cruz River project, in Laguna, covering a total area of over 10,000 hectares. Survey work was also practically completed for the Pampanga River project in Nueva Ecija, which embraces an area of about 30,000 hectares. This makes 31 projects, which have been surveyed and are ready for construction as soon as funds can be made available. These projects would irrigate a total area of over 160,000 hectares, while projects under, or awaiting, investigation would benefit an additional estimated area of 160,000 hectares. Investigations were in progress at the end of the year, with survey parties in the field, on the Bago River project, Occidental Negros; Naguilian River project, La Union; Agno River project, Pangasinan and Pampanga River project, Nueva Ecija.

FIVE-YEAR PROGRAM FOR THE CONSTRUCTION OF IRRIGATION PROJECTS

In addition to insular irrigation projects now under construction, the following projects have been tentatively included in the program for the construction of irrigation projects from the twenty million pesos appropriation authorized by Act 3011:

Project	Province	Irrigable area	Estimated cost	Remarks
Murong	Nueva Vizcaya	1,500	₱130,000	
Sibalom	Antique	3,800	500,000	Construction Recommended in 1922.
Santo Tomas River	Zambales	4,000	450,000	
Capas (San Miguel Extension).	Tarlac	4,500	285,000	Construction Recommended in 1922.
Peñaranda River	Nueva Ecija and Bulacan.	17,500	2,300,000	Do.
Barugo	Leyte	1,000	200,000	
Agno River	Pangasinan	30,000	5,000,000	
Pampanga River	Nueva Ecija	25,000	3,000,000	
Pañgiplan River	Occidental Negros.	3,000	400,000	
Bacnotan	La Union	2,000	200,000	
Santa Cruz River	Laguna	5,000	650,000	
Daet–Talisay	Camarines Norte	4,000	500,000	
Total		101,300	13,615,000	

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the Division made a total of 2,393 stream measurements during the year at 203 permanent and 31 temporary gaging stations. Daily gage height readings were made at all permanent stations and records kept of 10 rain gages, established in localities where Weather Bureau records are not available. A total of 43 permanent gaging stations were abandoned for various reasons during 1922 and 25 new stations established, leaving 160 permanent stations to be maintained at the end of the year. The hydrographic data collected at a total of 235 stations, covering periods of from 1 to 10 years, has been compiled and is now ready for publication in bulletin form to make it more serviceable to the public.

The current meter rating station in Manila was completely overhauled during the year making it possible to rate meters in a much more accurate manner. A total of ₱55,507 were expended on hydrographic investigations in 1922.

WATER RIGHTS

A total of 222 applications for water rights were received, 177 of which were for irrigation and 45 for power development purposes. A total of 229 applications were finally acted upon, 161 of which were granted and 68 disapproved by the Secretary of Commerce and Communications upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 10,142 hectares of land. There are 66 applications pending action by the Irrigation Council. Fourteen applications for power development were approved for developing a maximum of 1,275½ horsepower, seven of which were filed in 1922.

Complete determination of old water rights was made on two streams during the year making the total number of streams so adjudicated to date 20. The adjudications completed during the year 1922 involve 6,677 separate rights or parcels of land and affect the title to water for irrigating 20,595.2 hectares of land. There were nine streams designated for adjudication during the year 1922.

Surveys have been completed and maps prepared showing all water right locations on four streams. These surveys included 26,400 hectares of irrigated lands. The streams which have been surveyed and are now pending adjudication are given in the following:

Stream	Province	Number of diversion ditches	Length of main canal in meters	Number of municipality affected	Approximate number of hectares irrigated
O'Donnel–Moriones and Tarlac Rivers.	Tarlac	2	4,000	4	10,100
Bued River	Pangasinan La Union, and Mountain Province.	193	30,300	6	5,500
Ange and Gogo Rivers	Pampanga	25	970	4	5,200
San Jose, Anayan, and Pauili Rivers.	Ambos Camarines	59	15,000	2	5,600
Total					26,400

Surveys are in progress with surveying parties in the field on the following streams:

Stream	Province	Municipality affected	Approximate area of land irrigated in hectares
Banila River	Pangasinan	Rosales, Balungao, Umingan, and Santa Maria.	12,000
Andulan or Burubor River.	do.	Balungao and Rosales	1,000
Bued or Nantayangan River.	Nueva Ecija and Pangasinan.	Cuyapo, Nueva Ecija, and Rosales, Pangasinan.	1,500
Porac	Pampanga	Lubao, Floridablanca, Porac, and Guagua.	3,200
Gumain	do.	Lubao, Floridablanca, Porac, and Guagua.	1,200
Caulaman	Pampanga and Bataan.	Lubao, Dinalupihan, and Hermosa.	300
Total			19,200

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream	Province	Municipality affected	Approximate area of land irrigated in hectares
Nasisi River	Albay	Ligao and Oas	1,000
Ynarihan River	Camarines Norte	Naga, Magarao, and Cabalanga	1,200
Maoguingoguing River	Ilocos Norte	Vintar	500
Lubnac Estero	do.	Sarrat	300
Burnay River	do.	Solsona and Dingras	1,500
Nagdesaagan River	do.	Piddig	800
Paoay Lake	do.	Paoay and Batac	500
Banglayan River	Ilocos Sur	Narvacan	2,000
Codoog or Barangobong River.	do.	Narvacan and Nagbukel	1,000
Matictic Creek	Nueva Ecija	Bongabon	400
Parasapas Creek	Pangasinan	Tayug and Natividad	300
Malabago or Anondaan River.	do.	Malasiqui, San Carlos, Calaciao, and Santa Barbara.	1,000
Maolo River	do.	Sison and Pozorrubio	2,500
Gogo and Buge Esteros.	Tarlac	Concepcion	1,000
Pias Estero	do.	Moncada and San Manuel	500
Canpuclo River	Tayabas	Candelaria	500
Total			15,000

RIVER CONTROL PROJECTS

Plans were prepared by the Division for 15 river control projects and investigations and studies made on 10 others as shown in the following table:

Province	Municipality	Name of river	Type of work	Estimated cost	Status
Albay	Libon	Calacran	Diversion by earth dam and dykes	[a]	Not financed.
Do.	Guinobatan	San Francisco	Dry rubble bank revetment	₱9,208.61	Do.
Batangas	Balayan	Binambang	Earth levee	27,000.00	Do.
Do	Batangas	Batangas	Repair of spur dykes	5,000.00	Do.
Bohol	Dimiao	Tangojay	Bell guide bank bridge protection		Road funds.
Camarines Sur	Goa	Rangas	Improvement of channel		Not financed.
Capiz	Calivo	Aclan	Partial closure of Sooc Creek by permeable dams and bank revetment.	50,000.00	65 per cent complete.
Cebu	Asturias	Asturias	Bank protection		Not recommended.
Do	Talisay	Bulacao	Change and improvement of channel	20,000.00	Under construction.
Do.	Carcar	Carcar	Earth levee around town and channel straightening.	40,000.00	Not financed.
Davao	Davao	Davao	Dry rubble bank revetment	60,000.00	Do.
Iloilo	Igbaras	Igbaras	Bank revetment		Do.
Do	La Paz	La Paz	Earth levee		Do.
Ilocos Norte	Paoay	Gabur	do		Report only.
Ilocos Sur	Vigan	Govantes	Earth dam to close Govantes River		
Leyte	Alang-Alang	Mainit or Cabayungan	Dike and bank protection		Under investigation.
Do	Hinunangan	Hinunangan	Earth dyke		Under investigation.
Marinduque	Boac	Boac	Concrete block bank revetment	23,000.00	Completed.
Pampanga	Santa Rita, Bacolor, Betis, and Guagua	Potrero or Pasig and Gumain.			Under investigation.
Do	Arayat, San Luis, San Simón, and Apalit.	Pampanga	Repairs of Arnedo Dyke	30,000.00	83 per cent complete.
Pangasinan	Hermosa	Agno	Spur dykes of untrimmed trees	20,000.00	Under construction.
Do	Asingan	do.	Earth dykes and cut-off channel	100,000.00	Not financed.
Samar	Catarman	Catarman	Repairs of Spur kykes	12,000.00	Do.
Tarlac	Tarlac	Tarlac	Concrete blook bank revetment	50,000.00	Completed.
Do	San Miguel	O'Donnell	Protection of levees	20,000.00	80 per cent complete.

[a] Not yet made.

Construction work was carried out by District Engineers on all projects, excepting the O'Donnel River dyke, which was under the direct supervision of the Division.

Mr. C. G. Wrentmore, who was engaged under a special contract, in June, 1920, to "make an examination and study of the problems of control on the Agno, Tarlac, and Pampanga River systems, with a view to reducing or eliminating damages from floods and reclaiming the land in what are known as the Mañgabol and Candaba swamps," submitted his complete report on July 1, 1922. After studying the recommendations contained in this report and considering the numerous factors entering into the practical solution of the flood control problems in question, it was recommended that a commission be appointed to consider Mr. Wrentmore's recommendations, to collect further data on the losses caused by floods, to determine upon an equitable basis for financing construction and to submit a report covering their findings. A commission composed of the Under Secretary of Agriculture and Natural Resources, Chief Engineer, Manila Railroad Co., Director of Forestry, and the Chief Irrigation Engineer, was duly appointed by Executive Order in September, 1922, and it is understood that their report will be submitted during the early part of 1923.

WATERWORKS

Designs and estimates were prepared for 11 waterworks projects approved for construction during the year and for a large number of projects which municipalities and provinces desire to have financed by the sale of bonds under the provisions of Act 2980, as amended by Act 3009. The necessary resolutions have been adopted in many cases covering the sale of bonds for financing many of the large projects, such as the Iloilo, Laoag, and Cavite projects, which have been under consideration for several years.

General regulations to govern the administration, operation, and maintenance of municipal and provincial waterworks were drafted by the Division during the year with a view to putting the operation of all completed systems on a sound financial basis and effecting systematic and efficient management. These regulations were submitted shortly before the end of the year and are pending approval.

Construction work was undertaken by District Engineers on nine new projects and continued on 34 projects, 11 of which were completed during the year. This makes a total of 105 waterworks systems in 31 provinces, which have been completed to date, at a cost of ₱3,347,754.31. These completed systems furnish potable water to a total population of 328,611. The 32 projects now under construction will supply a population of 86,538 at an estimated cost of ₱1,733,956, and 71 proposed systems would serve 324,576 people at an estimated cost of ₱5,330,700.

The status of all waterworks projects to date is shown in the following lists:

List (A)—Waterworks projects under construction.
List (B)—Waterworks projects completed.
List (C)—New waterworks projected.

LIST (A).—*Waterwork projects under construction*

Province	Municipality	Type of system	Population to be served	Estimated cost	Insular allotment	Municipal allotment
Abra (Ilocos Sur)	Bangued	Gravity	6,600	₱130,000.00	₱75,000.00	₱40,000.00
Batangas	Lemery	Pumping	7,200	45,000.00	25,000.00	15,411.19
Do	Taal Extension	do.	4,000	69,000.00	20,000.00	10,000.00
Bohol	Loon	Gravity	5,000	33,000.00	22,000.00	11,000.00
Bulacan	Malolos [a]	Pumping	6,000	140,000.00	11,000.00	13,594.57
Cavite	Indang [a]	do.	3,000	42,000.00	20,000.00	10,213.00
Do	Mendez-Nuñez	Pump and Hydro Elec.	1,600	60,000.00	36,833.33	18,800.00
Cebu	Cordova [a]	Rain–Tank	1,191	7,500.00	3,000.00	1,500.00
Do	Daanbantayan [a]	do.	579	7,500.00	4,000.00	2,000.00
Do	Dalaguete Extension	Pumping	3,500	57,000.00	5,000.00	2,500.00
Do	Opon	do.	1,500	34,000.00	21,000.00	12,000.00
Do	Tuburan	Gravity	3,900	60,000.00	25,000.00	19,000.00
Laguna	Magdalena	do.	3,000	68,000.00	40,000.00	21,210.79
Marinduque	Gasan	Pumping	1,400	24,468.00	16,303.33	8,156.00
Do	Malbog	Gravity	1,000	16,000.00	10,000.00	5,000.00
Mountain Province	Apayao (Kabuyao)		800	7,000.00	5,000.00	
Do	Baguio	Pumping and gravity	6,000	150,000.00	75,000.00	47,500.00
Do	Lubuagan	Gravity		12,000.00	5,000.00	
Nueva Ecija	Cabanatuan	Pumping	6,000	106,000.00	50,000.00	25,620.00
Oriental Negros	Dumaguete	do.	4,000	84,988.00	48,200.00	24,100.62
Do	Maria Extension	Gravity	1,000	3,000.00	2,000.00	1,000.00
Palawan	Bacuit	do.	1,000	3,200.00	2,500.00	700.00
Do	Balabac Extension [a]	do.	800	5,000.00	3,200.00	
Do	Barrio Bintuan	do.	1,000	5,500.00	3,700.00	1,000.00
Do	Cuyo	Pumping	800	10,000.00	6,650.00	3,000.00
Do	Oton [a]	Gravity	328	5,000.00	3,000.00	
Do	Puerto Princesa Reconstruction [a]	Pumping		3,300.00	2,200.00	
Pampanga	Arayat	Gravity	3,840	20,000.00	12,800.00	6,400.00
Romblon	Looc [a]	do.	2,000	32,000.00	17,000.00	15,000.00
Samar	Catbalogan	do.	2,000	63,000.00	40,000.00	20,000.00
Tayabas	Mauban	Pumping	3,500	54,000.00	34,000.00	17,000.00
Zambales	San Antonio	Gravity	4,000	75,000.00	25,000.00	(b)
Total			86,538	1,733,956.00	669,386.66	351,746.17

[a] Projects begun in 1922.

[b] One-third cost guaranteed by the municipal Council and Provincial Board.

LIST (B).—*Waterworks project completed*

Province	Municipality	Population served	Cost	System	Remarks
Albay	U. S. Resident Regan Barracks, Albay and Legaspi.	6,000	₱60,000.00	Crude oil and steam pumping.	Construction by Military Government 1908; Extension and new engine installed, 1920.
Antique	San Jose [a]	4,000	41,846.74	Pumping	
Batangas	Balayan	2,000	7,353.92	Gravity	
Do	Batangas [a]	6,147	71,529.95	Pumping	
Do	Cuenca	2,500	5,000.00	Gravity	
Do	Lipa	5,000	103,065.87	Pumping	
Do	San Jose	4,000	44,099.45	Gravity	
Do	Santo Tomas (Kalaw [a])	1,910	27,108.65	do.	
Do	Taal	5,000	91,188.34	Pumping	
Bohol	Dauis	840	5,100.00	Gravity	
Do	Duero	2,000	10,823.56	do.	
Do	Jagna	3,000	24,115.26	do.	
Do	Loay	3,000	18,968.72	do.	
Do	Mabini [a]	1,300	6,750.00	do.	
Do	Tagbilaran	5,245	13,837.47	Pumping	
Do	Tubigon	4,800	34,094.06	do.	
Bukidnon	Deliric	600		Gravity	
Do	Malaybalay	1,300	11,641.16	do.	
Do	San Luis	500	650.00	do.	
Bulacan	Marilao [a]	(b)	22,101.50	do.	
Do	Hagonoy	2,789	7,564.87	do.	
Do	Sibul	(c)	(c)	do.	
Camarines Norte.	Mambulao	No Data	1,200.00	Gravity	
Capiz	Capiz	6,400	13,541.92	Concrete tank.	
Cebu	Barili	2,067	26,958.28	Gravity	
Do	Carcar	4,463	64,004.45	do.	
Do	Catmon	1,624	16,399.56	do.	
Do	Cebu	65,000	518,540.13	do.	
Do	Cebu-Labangon	(d)	16,000.00	do.	
Do	Cebu-Sambag [a]	(d)	35,789.18	Pumping	
Do	Dalaguete	2,480	14,941.15	do.	
Do	Dumanjug	1,500	31,380.28	do.	
Do	Ginatilan	2,669	13,484.80	Gravity	
Do	Malabuyok	1,500	14,941.15	do.	
Do	Moalboal	2,108	14,297.27	do.	
Do	Oslob, (barrio)				
Do	Mainit		2,000.00	do.	
Do	Pilar	702	5,019.21	do.	
Do	Poro	1,000	8,873.63	do.	
Do	Naga	3,333	6,800.00	do.	
Do	Naga extension.	(e)	4,552.48	do.	
Do	Samboan	2,741	7,314.11	do.	
Do	San Francisco	1,243	6,200.00	do.	
Do	Sibonga	2,661	35,300.00	do.	
Do	Tudela	851	8,263.29	do.	
Cotabato	Parang	600	9,600.00	Hydraulic ram.	
Davao	Davao [a]	6,000	137,195.14	Gravity	
Ilocos Sur	Vigan	8,440	127,399.52	do.	

[a] Completed in 1922.

[b] Bath house.

[c] San Miguel Improvement, no record.

[d] Part of Cebu.

[e] Part of Naga.

LIST (B).—*Waterworks project completed*—Continued

Province	Municipality	Population served	Cost	System	Remarks
Isabela	Ilagan	(f)	(f)	Gravity	
Laguna	Bay	1,471	₱2,767.72	do.	
Do	San Pablo	7,000	89,455.82	do.	
Do	Santa Cruz	6,000	92,692.43	Pumping	
Do	Majayjay	3,200	38,686.06	Gravity	
Do	Nagcarlang	2,500	35,890.37	do.	
Do	Pagsanjan	4,044	73,782.67	Pumping	
Marinduque	Boac	1,000	6,653.00	do.	
Do	Mogpog	1,280	10,535.69	Gravity	
Do	Santa Cruz	2,560	20,696.23	do.	
Mindoro	Abra de Ilog	350	4,743.74	do.	
Do	Calapan	2,500	29,743.47	Pumping	
Misamis	Balingasag	1,514	8,924.14	Gravity	
Misamis	Cagayan [a]	3,000	50,408.82	Pumping	
Do	Mahinog	5,727	6,000.00	Gravity	
Do	Mambajao	14,446	30,000.00	do.	
Do	Sagay	6,321	800.00	do.	
Mountain Province.	Cervantes [a]	800	7,565.07	do.	
Do	Teachers' Camp and Country Club.	1,500	(i)	do.	
Do	Mansion House.	100	(i)	Pumping	
Do	Trinidad Farm School. [a]	300	19,330.92	Gravity	
Do	Trinidad Stock Farm. [a]	60	2,000.00	do.	
Oriental Negros.	Siquijor Poblacion.	1,587	18,000.00	do.	
Do	Barrio Siquijor.	494		do.	
Do	Luzuriaga	2,500	12,317.44	do.	
Do	Barrio Talinting, Siquijor.	2,890	5,025.00	do.	
Do	Basac	265		Hyd. ram.	
Do	Maria	1,000	1,353.05	Gravity	
Do	Lazi	2,300	6,980.77	do.	
Palawan	Puerto Princesa	716	10,268.45	Pumping	
Do	Coron	1,150	7,844.63	do.	
Pampanga	Angeles	6,708	12,318.52	Steam pumping.	
Do	San Fernando	1,000	1,050.02	Pumping	
Pangasinan	Bani	2,000	12,411.56	Gravity	
Do	Bayambang	2,400	8,652.80	do.	
Do	Dagupan	(g)	2,823.02	do.	
Do	Lingayen	(g)	3,938.99	do.	
Do	do.	(h)	9,141.22	do.	
Do	Mangaldan	(g)	635.53	do.	
Do	San Fabian	(g)	682.87	do.	
Rizal	Antipolo	2,250	23,299.07	Pumping	
Do	Pasig	10,000	40,000.00	do.	
Romblon	Romblon	2,300	(g)	Gravity	Originally built in 1864, Reconstruction 1900 by Military Government.

[a] Completed in 1922.

[f] Constabulary tank, no record.

[g] Market.

[h] School.

[i] Not available.

LIST (B).—*Waterworks project completed*—Continued

Province	Municipality	Population served	Cost	System	Remarks
Samar	Calbayog	(g)	(j)	Rain water tank.	
Do	Oras	4,000		Gravity	Constructed by Military Government.
Sorsogon	Bacon	3,200	₱21,000.00	do.	
Do	Magallanes	3,500	8,000.00	Pumping and Garvity.	
Do	Sorsogon	250	1,044.67	Pumping	Municipal Building.
Sulu	Jolo	722	76,974.29	do.	
Surigao	Barrio Bacuag, Gigaquit.	2,405	7,500.00	Gravity	
Do	Lianga	1,290	1,924.58	do.	
Do	Placer	870	13,133.95	do.	
Tayabas	Lucban	3,200	50,205.60	do.	
Do	Lucena	7,500	234,390.57	do.	
Do	Sariaya	6,000	37,935.00	do.	
Do	Tayabas	4,600	125,159.36	do.	
Zambales	Subic	1,628	10,670.82	do.	
Zamboanga	Zamboanga	5,000	305,561.30	Gravity and hydro electric.	
Total		328,611	3,347,754.31		

[g] Market.
[j] No record.

LIST (C).—*New waterworks projected*

Province	Municipality	Estimated cost	Population to be served	System
Albay	Guinobatan	₱54,000.00	5,000	Gravity.
Do.	Viga	15,000.00	3,316	
Batanes	Ivana	40,000.00	2,000	Gravity.
Do	Sabtang		748	No data.
Batangas	Balayan extension	1,500.00		Gravity from Balayan tank.
Do.	Bauan	69,000.00	4,714	Pumping.
Do.	Rosario	30,000.00	5,000	Do.
Do.	Tanauan	47,000.00	2,500	Gravity.
Bohol	Antiquera	9,000.00	2,600	Do.
Do.	Calape	30,000.00	2,600	Do.
Do.	Carmen	6,100.00	600	Do.
Do.	Corella	6,000.00	1,019	Do.
Do	Garcia-Hernandez	37,500.00	2,000	Do.
Do.	Valencia	20,000.00	1,435	
Bulacan	San Miguel	50,000.00	2,308	Pumping.
Cagayan	Aparri	346,000.00	9,195	Pumping.
Do.	Camalaniugan		2,248	
Do.	Lal-lo		1,382	

LIST (C).—*New waterworks project*—Continued

Province	Municipality	Estimated cost	Population to be served	System
Cagayan	Tuguegarao	₱201,000.00	12,000	Pumping.
Cavite	Cavite	140,000.00	10,911	Do.
Do.	Silang	50,000.00	4,000	Gravity.
Cebu	Alegria	19,000.00	1,080	Do.
Do.	Asturias	92,000.00	1,086	Pumping.
Do.	Argao	45,000.00	5,500	Gravity.
Do.	Balambang	31,000.00	4,818	Do.
Do.	Dumanjug extension	32,000.00	3,210	Gravity instead of pumping.
Do.	Oslob	15,000.00	2,000	
Do.	Ronda	15,000.00	1,880	Pumping.
Do.	San Fernando	30,000.00	3,050	Gravity.
Do.	Talisay	30,000.00	2,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Ram and gravity.
Ilocos Norte	Laoag (Metropolitan)	880,000.00	25,000	Gravity.
Ilocos Sur	Bantay	15,000.00	2,500	Do.
Do.	Santa Lucia		1,908	No data.
Do.	Santa	28,000.00	875	Gravity.
Iloilo	Iloilo (Metropolitan)	1,703,000.00	84,000	Do.
Do.	Pototan-Dingle	279,000.00	9,200	Do.
Isabela	Ilagan		2,539	No data.
Laguna	Alaminos	30,000.00	1,127	Gravity.
Do.	Calamba	40,000.00	3,463	(Not decided).
Do.	Lilio	39,000.00	2,238	Gravity.
Do.	Luisiana	60,000.00	1,811	Pumping.
Do.	Pila	60,000.00	2,171	Do.
Lanao	Dansalan		2,000	Hydro-electric.
La Union	Rosario	13,500.00	1,050	Gravity.
Do.	San Fernando	83,000.00	5,000	Do.
Leyte	Baybay	15,000.00	6,000	Pumping.
Do.	Burawen		3,038	Gravity.
Do.	Liloan	10,000.00	700	Do.
Do.	Maasim	15,000.00	3,300	Do.
Do.	Tacloban		6,632	No data.
Mindoro	Looc		1,623	Do.
Do.	Caluya		1,477	Do.
Misamis	Misamis	66,000.00	3,450	Pumping.
Marinduque	Torrijos	21,000.00	5,000	Gravity.
Palawan	Cagayancillo		1,066	Rain water tank.
Do.	Concepcion	3,600.00	600	Gravity.
Pangasinan	Lingayen	27,000.00	2,831	Do.
Do.	Dagupan		4,436	No data.
Do.	Malasiqui	30,000.00	2,613	Pumping.
Do.	San Manuel	52,000.00	4,375	Gravity.
Rizal	Pasig extension	27,000.00	5,200	Pumping.
Romblon	Despujol			No data.
Samar	Calbayog	20,000.00	5,907	Do.
Sorsogon	Barcelona	25,500.00	4,000	Gravity.
Do.	Sorsogon		1,396	No data.
Surigao	Surigao	70,000.00	6,400	Gravity.
Tarlac	Moncada	24,000.00	3,000	Do.
Tayabas	Mulanay	33,000.00	1,200	Do.
Do.	Tiaong	48,000.00	1,800	Do.
Do.	Pagbilao	90,000.00	2,300	Do.
Total		5,330,700.00	324,576	

APPENDIX

PROJECTS ACTIVE, JANUARY 1, 1923

Provinces	Road and trails				Bridges and culverts				Provincial administration buildings				Municipal administration buildings				Prisons			Schools				Construction and operation										
	Construction	Maintenance	Repair	Reconstruction	Construction	Maintenance	Repair	Reconstruction	Construction	Maintenance	Repair and alteration	Reconstruction	Construction	Maintenance	Repair and alteration	Reconstruction	Construction	Repair and alteration	Maintenance	Construction	Maintenance	Repair and alteration	Reconstruction	Markets and tiendas	Parks, ground, and athletic fields	Miscellaneous buildings	Ferries	Water systems	Automobile lines	Quarries	Telephone lines	Electric light plant	Miscellaneous	Total
Abra	6	3																		2								1			2		1	15
Agusan	5	3							1															1							1		8	19
Albay	2	4			1					1			1							1	1												4	15
Antique	6	2											2							4					1			1					2	18
Bataan	2	4											1							3													5	15
Batangas	6	2		1						1					1				1		2				3			3				4	18	42
Benguet	1	8		2									1										1			3			2				7	25
Bohol	6	3			1								2							5								2					9	28
Bukidnon	2	2																		1											2		2	9
Bulacan	5	3	2		2															11			1	1		1		1					10	37
Cagayan	2	2																		3							1						11	19
Camarines Norte	2	1		1				1																									1	6
Camarines Sur	5	2								1					1	1			1		1										1		3	16
Capiz	3	2											1							2		1		3			1						4	17
Cavite	17	4			3															1								1					4	30
Cebu	3	2											1							10						3		3					7	29
Cotabato	7	4		1																1						1	1				2		13	30
Davao	3	4																							1	1	1				3		13	26
Ilocos Norte	5	2							1			1	1			1				4		2	2	1									4	24
Ilocos Sur	7	4			1											1				4				1			1						3	22
Iloilo	13	3			1						1		2							15		2		5	1	1		1					15	60
Isabela	2	2		1	1								2							7						1							1	17
Laguna	8	3		1	3			1												9				1				1					3	30
Lanao	4	3		1		1							1											1							2		4	17
La Union	4	5		1																6														16
Leyte		2							1				4			1															1		2	11
Manila																										14							69	83
Marinduque	3	2			1																							2					4	12
Masbate	2	1																		2														5
Mindoro	2	4			2					4										3	2				1						1		3	22
Misamis	4	3																															1	8
Mountain	4	2			1						1		5									2		1		3	1	2			1		16	39
Nueva Ecija	6	7		2	4				2		1					1				7				2			1	2					2	37
Nueva Vizcaya	5	4																						1			1				1		4	16
Occidental Negros	9	3			2								1							9						2							1	27
Oriental Negros	4	5			1								1							1						1		2					5	20
Palawan	1	4			1		2						1							6		1						9			4		12	41
Pampanga	5	3	1		2								3							1					1	1		1					20	38
Pangasinan	10	2																		10			2			1							6	31
Rizal	3	3		1	1								1		1					12				1							1		2	26
Romblon	1	1			1						1									3								1					2	10
Samar	7	2		1	1															1				1				1					2	16
Sorsogon		3											1							2				1				1						8
Sulu	2	2																				2				1					1		14	22
Surigao	2	2													1					1													2	8
Tarlac	6	2		1	1															1						1							1	13
Tayabas	3	2		1	3				2				1							3				2	2			1					2	22
Zambales	2	2									1									2								1			1		1	10
Zamboanga	5	6																		2					1	1					1		12	28
Total	212	144	3	15	34	1	2	2	7	7	5	1	33		4	5			2	155	6	10	6	23	11	36	8	37	2		25	4	335	1,135

NOTE.—Of the 335 projects under the caption "Miscellaneous," there are 13 surveys and investigations of roads, market sites, bridge site, etc., 33 artesian wells, 7 port works construction and maintenance, 1 harbor maintenance project, 19 irrigation systems, 12 wharves, 4 river control projects, 3 custom-houses, 2 dredging projects, 9 dyke projects, 22 Constabulary buildings, 6 irrigation ditches, 3 water tanks, 17 hospital projects, 2 dams, 6 monuments, 22 wireless station projects, 5 docks, and 149 other less important projects.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1928]

JOSE PAEZ, ***Director of Public Works***
MARCIAL KASILAG, ***Chief Constructing Engineer***
E. C. EARLE, ***Chief Designing Engineer***
A. D. WILLIAMS, ***Chief Irrigation Engineer***
TOMAS MAPUA, ***Supervising Architect***
JUAN ARELLANO, ***Supervising Architect***

CENTRAL OFFICE ORGANIZATION

ADMINISTRATIVE DIVISION

Francisco Cruz, Chief Clerk.
  Rosendo Reinoso, Chief Accountant.
  T. Camu, Cashier and Disbursing Officer.
  Primo Villar, Law and Records Clerk.
  Jose de Jesus, Property Clerk.
  J. A. V. Corpus, M. E., Acting Superintendent of Automobiles.

DESIGNING DIVISION

W. J. Grodske, Project Engineer.
  L. L. Vincent, E. and M. E.
  L. H. Thompson, E. and M. E.
  J. C. Cookingham, C. E.
  R. S. Clemons, E. and M. E.
  Lope Gonzaga, E. and M. E., Chief Electrician.
  M. C. Collins, C. E.
  T. A. Mills, C. E.
  J. Vallarta, C. E.
  D. Guanio, C. E.
  J. Piedad, C. E.
  E. Segui, C. E.
  A. Villanueva, Asst. C. E.
  V. Gloria, Asst. C. E.
  V. Villanueva, Asst. Electrical Engineer.
  Ciriaco Coronel, Asst. E and M. E.
  Manuel Felizardo, Asst. M. E.
  W. Berry, Pile Driver Superintendent.

DIVISION OF ARCHITECTURE

Cheri Mandelbaum, Architect.
  Antonio Toledo, Architect.
  Frank F. Reynolds, Asst. Engineer.
  Antonio Tayzon, C. E.
  Gonzalo T. Vales, C. E.
  Teodato P. Macabulos, C. E.
  V. Fernandez Lavadia, Asst. C. E.
  Ambrosio Dias, Jr. C. E.
  Juan Altiveros, Architect.

CONSTRUCTING DIVISION

  E. D. Smith, Div. E., First Division.
  Melecio Arranz, Div. E., Second Division.
  Luis Francisco, Div. E., Third Division.
  Vicente Fragrante, Div. E., Fourth Division.
  L. T. Clark, Div. E., Fifth Division.
  Juan Macaraeg, Div. E., Sixth Division.
N. S. Saleeby, Highway Engineer.
  A. T. Sylvester, Constructing Engineer.
  V. L. Legarda, C. E., Superintendent, Maintenance, Alteration and Repair.
  H. C. Garretson, C. E.
  H. Franco, Chief Electrician.
  V. Castillo, Superintendent of Dredges.
  R. Custodio, Superintendent of Construction, Batanes.
  Isabelo Lagniton, C. E.
  Fred McCaw, Acting Superintendent of Artesian Wells.
  Q. Canus, Traveling Inspector.

IRRIGATION DIVISION

Emilio Quisumbing, Designing Engineer.
Nicanor Cortes, Designing Engineer.
Angel Martinez, Asst. Designing Engineer.
W. J. Lamon, Project Engineer.
E. L. Driggs, Project Engineer.
P. W. Mack, Project Engineer.
Leon Ines, Project Engineer.
Gonzalo Garcia, Project Engineer.
Ricardo Nostratis, Project Engineer.
John P. Utinsky, Acting Project Engineer.
H. O. Bauman, Project Engineer.
Gaudiose Cruel, Project Engineer (Acting)
Hilario Clemente, C. E.
Gregorio de Leon, Asst. C. E.
Deogracias de la Paz, Asst. C. E.
Manuel Gonzalez, Asst. C. E.
Julian Buendia, Asst. C. E.
Miguel Garcia, Asst. C. E.
Faustino Salvador, Asst. C. E.
Agapito Alane, Asst. C. E.
Graciano J. Militante, Asst. C. E.
Justo Arrastia, Asst. C. E.
Vicente Alcañeses, Jr. C. E.
Fernando Arnaldo, Jr. C. E.
Ramon C. Calaya, Jr. C. E.
Jacinto Gocheco, Chief Hydrographer.
W. Demmers, Supervising Hydrographer.
Antonio Baldonado, District Hydrographer.
Manuel Trani, Asst. Hydrographer.
Francisco Aquino, Asst. Hydrographer.
P. del Castillo, Jr. Hydrographer.
Artemio Abaya, Chief Water Rights Inspector.
Modesto Villalobos, Asst. Chief Water Rights Inspector.
Mariano N. Leones, Supervising Surveyor.

DISTRICT ORGANIZATION

E. J. HALSEMA, D. E., Benguet
E. D. Smith, Div. E. & D. E., Vigan, Ilocos Sur.
  Gregorio Alcantara, Acting D. E., Ilocos Norte.
  Bernabe V. Gregorio, Jr. C. E., Ilocos Norte.
  Arturo P. Nitorreda, D. E., Ilocos Sur.
  B. F. Saldaña, Asst. C. E., Ilocos Sur.
  Manuel Diaz, Acting D. E., La Union.
  Roque Peredo, Acting D. E., Mt. Province.
  Adriano Medina, Jr. C. E., Mt. Province.
  Saturnino Lopez, D. E., Pangasinan.
  Rafael Acosta, Jr. C. E., Pangasinan.
  Mamerto Cruz, D. E., Cagayan.
  Rafael Ungson, Asst. C. E., Cagayan.
  Tomas Lorenzo, Asst. C. E., Cagayan.
  Mamerto Cruz, D. E., Isabela.
Melecio Arranz, Div. E., Manila.
  Vicente Oledan, Acting D. E., Nueva Vizcaya.
  Paulino Stuart, Overseer, Nueva Vizcaya.
  Vicente Orosa, D. E., Nueva Ecija.
  Pio C. Mojica, Overseer, Nueva Ecija.
  Pio Clemente, Overseer, Nueva Ecija.
  Jaime Laguardia, Acting D. E., Tarlac.
  Mariano A. de Castro, Acting D. E., Pampanga.
  Alfredo V. Martinez, Acting D. E., Zambales.
  Joaquin Galza, Acting D. E., Bataan.
  Severino Fernandez, D. E., Bulacan.
  Lorenzo Ortiz, Acting D. E., Rizal.
  Ramon Borromeo, Jr. C. E., Rizal.
  Francisco Alvarez, Acting D. E., Cavite.
  Jose Villaroel, Jr. C. E., Cavite.
Luis Francisco, Div. E., Manila.
  Fidel V. Larracas, D. E., Batangas.
  Jose Villanueva, Overseer, Batangas.
  Bonifacio Villanueva, Acting D. E., Laguna.
  Homobono H. Gonzalez, Asst. C. E., Laguna.
  Dalmacio Urtula, D. E., Tayabas.
  Abelardo R. Icasiano, Asst. C. E., Tayabas.
  Martin M. Resplandor, Acting D. E., Mindoro.
  Rosalio Villalon, Acting D. E., Marinduque.
  Aurelio N. Cobangbang, Acting D. E., Camarines Norte.
  Silvestre Tan Chauco, Acting D. E., Camarines Sur.
  Pedro Lorenzo, Surveyor, Camarines Sur.
  V. J. Bagtas, D. E., Albay.
  Emilio Buenaventura, Jr. C. E., Albay.
  Simeon D. Guerrero, Overseer, Albay.
  Sergio Bayan, Acting D. E., Sorsogon.
  Jose Wright, Acting D. E., Masbate.
Vicente Fragante, Div. E., Manila.
  Alejo Aquino, Acting D. E., Iloilo.
  A. Fernandez de Castro, Asst. C. E., Iloilo.
  Roman O. Ylagan, Jr. C. E., Iloilo.
  Fernando Pariño, Overseer, Iloilo.
  Angel Flores, Overseer, Iloilo.
  Isaias Fernando, D. E., Capiz.
  Hospicio I. Fernandez, Asst. C. E., Capiz.
  Jose Arquisola, D. E., Antique.
  Filomeno Piczon, Acting D. E., Romblon.
  Maximo Dimson, Acting D. E., Occidental Negros.
  Ariston Florendo, Asst. C. E., Occidental Negros.
  Manuel Tubungbanua, Jr. C. E., Occidental Negros.
L. T. Clark, Div. E., Cebu.
  Valeriano Segura, D. E., Cebu.
  Jose Gandiondo, C. E., Cebu.
  Ambrosio Osmeña, Acting D. E., Oriental Negros.
  Carlos Rodriguez, Jr. C. E., Oriental Negros.
  Rufino Garcia Acting D. E., Bohol.
  H. R. Meehleib, Acting D. E., Leyte.
  Liborio Urtizberea, Asst. C. E., Leyte.
  Mariano F. Chiyuto, Jr. C. E., Leyte.
  Pastor Avisado, D. E., Samar.
  Pedro M. Lladoc, Asst. C. E., Samar.
  Ciriaco P. Rama, Surveyor, Samar.
  Cirilo Cabileto, Acting D. E., Lanao.
  Rey N. Allen, D. E., Misamis.
  Marcelo Operario, Jr. C. E., Misamis.
  Roy N. Allen, D. E., Bukidnon.
  T. J. Medicielo, Acting D. E., Surigao.
Juan Macaraeg, Div. E., Zamboanga.
  Juan Macaraeg, D. E., Zamboanga.
  Ireneo M. Santos, Asst. C. E., Zamboanga.
  Fred J. Legare, Overseer, Zamboanga.
  Jose Follosco, Acting D. E., Cotabato.
  Cenon C. Moreno, Jr. Surveyor, Cotabato.
  Jose Lozada, Acting D. E., Davao.
  V. C. Bustamante, Surveyor, Davao.
  W. J. Hollis, Acting D. E., Sulu.
  Sixto R. Relis, Surveyor, Sulu.

LEGEND

Div. E. = Division Engineer.
C. E. = Civil Engineer.
D. E. = District Engineer.
E. & M. E. = Electrical and Mechanical Engineer.
J. C. E. = Junior Civil Engineer.

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THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS ·

BULLETIN

Vol. 12 JANUARY 1, 1924 No. 1

GIRLS' DORMITORY, HIGH SCHOOL, LUCENA, TAYABAS

205364

CONVERSION TABLE

One peso (₱) = 50 cents, U. S. currency.
One kilometer (Km.) = 0.62 miles.
One kilogram (Kg.) = 2.20 pounds (lbs.).
One centimeter (cm.) = 0.39 inches.
One meter (m.) = 3.28 feet.
One hectare = 2.47 acres.
One cubic meter (cu. m.) = 1.31 cubic yards.
One hectare meter per day = 8.107 acre feet per day.
One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) second feet.

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1923

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

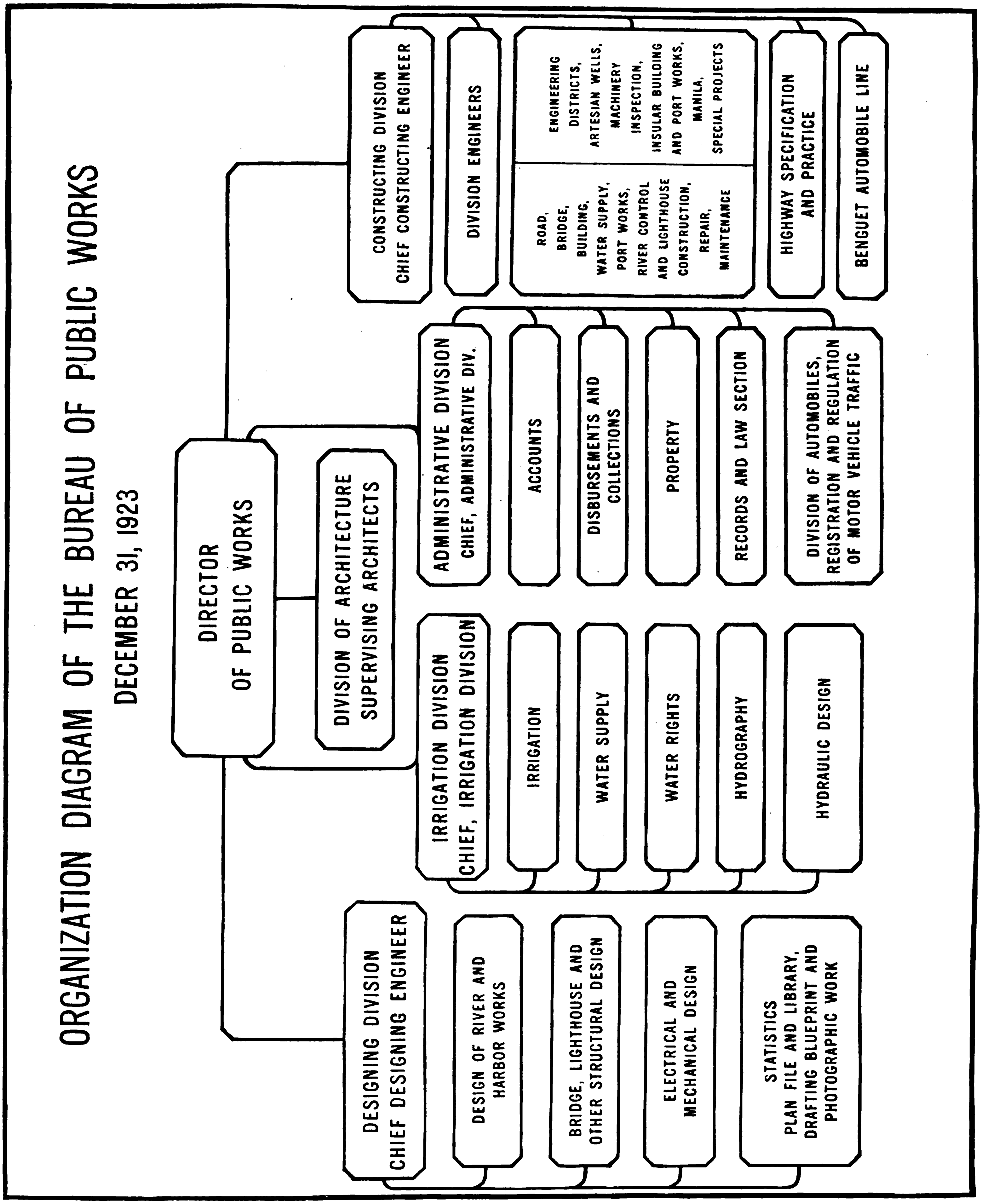
MANILA, P. I., March 18, 1924

SIR: I have the honor to submit herewith the Report of the Bureau of Public Works for the Fiscal Year ending December 31, 1923, which was prepared under the direction of Mr. Jose Paez, who resigned as Director of Public Works, effective March 13, 1924.

Very respectfully,

A. D. WILLIAMS
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.



ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1923

DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
DIVISION ENGINEERS
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE
ADMINISTRATIVE DIVISION CHIEF, ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS PLAN FILE AND LIBRARY, DRAFTING BLUEPRINT AND PHOTOGRAPHIC WORK

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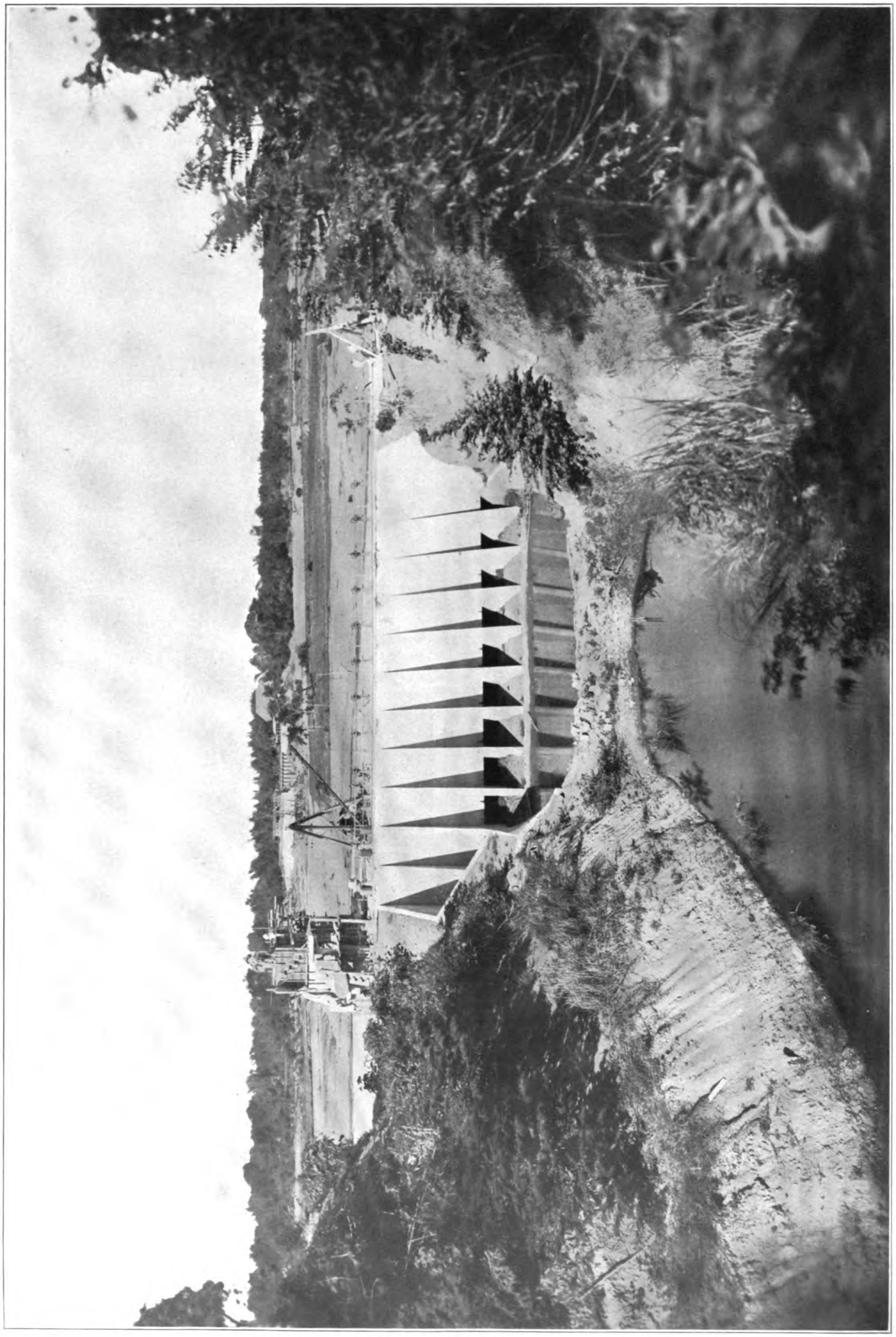


ANGAT RIVER DIVERSION WORKS, LOOKING NORTH NEAR AXIS OF DAM. SOUTH HEADWORKS IN FOREGROUND, BULACAN PROVINCE

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and principal functions of the Bureau of Public Works are shown in the accompanying diagram. The district engineer is the local representative of the Bureau in the 46 engineering districts comprising the Philippine Islands except in the case of the larger insular irrigation and portworks projects, which are being constructed by project engineers under the direct supervision of the Irrigation Division and Designing Division, respectively. Six division engineers with headquarters at the Central Office in Manila exercise direct supervision over the work of the district organizations. Plans and specifications for all public works are prepared by the Manila Office of the Bureau and have been standardized so far as practicable.

The low salary schedule now authorized continues to be responsible for the Bureau losing many of its experienced and valuable technical employees. The revision of this schedule in accordance with previous recommendations is, therefore, considered necessary in order to maintain and improve the efficiency of the organization.

PERSONNEL

Number of employees paid direct from Bureau and Project Funds as of December 31, 1923: Americans, 29; Filipinos, 489.

(NOTE.—The corresponding figures for December 31, 1922, are 26 and 302, respectively.)

Number of technical employees, December 31, 1923: Americans, 16; Filipinos, 122.

(NOTE.—The corresponding figures for December 31, 1922, are 20 and 108, respectively.)

American technical employees

Position	Classified	Unclassified	Total
Civil engineer	10	0	10
Assistant engineer	1	0	1
Electrical-mechanical engineer	2	1	3
Structural engineer	0	0	0
Surveyor	1	0	1
Architect	1	0	1
Total	15	1	16

Filipino technical employees

Position	Classified	Unclassified	Total
Civil engineer	33	11	44
Assistant engineer	0	1	1
Assistant civil engineer	31	19	50
Junior civil engineer	4	7	11
Mechanical engineer	1	0	1
Assistant mechanical engineer	0	1	1
Assistant mechanical and electrical engineer	0	1	1
Assistant electrical engineer	1	0	1
Junior electrical engineer	1	0	1
Surveyor	4	2	6
Supervising architect	2	0	2
Architect	2	1	3
Total	79	43	122

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau, by whatever branch of the Government paid:

Changes	American	Filipino	Total 1923	Total 1922
Number of appointments	0	221	221	272
Number of transfers to Bureau	0	10	10	4
Number of separations for cause	1	13	14	20
Number of voluntary resignations	4	132	186	183
Number of transfers from Bureau	0	6	6	12
Number of separations due to retirement	1	1	2	5
Number of separations due to expiration of employment	1	3	4	9
Number of deaths	0	4	4	6

NOTE.—Item "Number of appointments" includes new and probational appointments.

On account of the reduced appropriations provided for public works during 1923, the activities of the Bureau were confined largely to maintainance work and continuing construction work on projects started during previous years. The results obtained on the whole are considered very satisfactory and are set forth in detail in the following tabulations and report:

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1922 AND 1923

Items	Insular expenditures				Provincial and municipal expenditures		Fund from private sources		Total	
	Bureau of Public Works		Appropriation controlled by other Bureaus							
	1922	1923	1922	1923	1922	1923	1922	1923	1922	1923
Roads and bridges	₱146,610.20	₱129,896.70	₱72,935.57	₱13,122.34	₱6,629,621.77	₱7,027,851.56			₱6,849,167.54	₱7,170,870.60
Telegraph, telephone, and cable lines	20,835.34	693,557.29							20,835.34	693,557.29
Buildings	1,387,766.86	291,237.96	15,712.02	60,817.68	2,431,095.37	1,272,921.84	(₱1,856.19)		3,832,718.06	1,624,977.48
Wireless station buildings including towers and masts	209,475.28	68,135.59	57,826.22	22,541.73					267,301,50	90,677.32
Maintenance, alteration, and repairs of public buildings	487,963.12	397,043.05	732.67	(296.71)	117,821.98	160,107.12	(3.16)	₱3,250.00	606,514.61	560,102.46
River and harbor work including purchase and reconstruction of equipment, lights, buoys, and beacons	5,317,036.09	1,061,424.59	88,219.69	1,426,673.76	19,764.33	12,447.12		5,516.50	5,425,020.11	2,506,061.97
Artesian wells and water supply	304,835.21	206,067.68	16,809.09	38,638.22	413,701.07	441,987.48	3,949.40	10,193.63	739,294.77	696,887.01
Irrigation projects	2,552,554.09	211,257.86	14,888.35	1,648,962.61	7,006.13	5,967.30	3,019.95	18,643.21	2,577,468.52	1,884,830.98
Benguet automobile line	88,707.55	80,000.00							88,707.55	80,000.00
Registration and regulation of motor vehicle traffic	47,774.93	60,000.00							47,774.93	60,000.00
Los Baños quarry	106,300.15	103,392.93							106,300.15	103,392.93
Operation and maintenance of central garage		30,822.46								30,822.46
Miscellaneous	2,000.00	10,402.13	166,381.21	152,845.51	182,410.68	152,726.95	5,219.48	5,049.92	356,011.37	321,024.51
Total	10,671,858.82	3,343,238.24	433,504.82	3,363,305.14	9,801,421.33	9,074,009.37	10,329.48	42,653.26	20,917,114.45	15,823,206.01

BALANCE SHEET, BUREAU OF PUBLIC WORKS

Assets	1922	1923
CURRENT:		
Cash, collecting and disbursing officers	₱1,191,542.57	₱1,404,043.14
Cash, (deposits), Insular Treasury	6,257,295.03	(810,970.64)
Accounts receivable	929,136.95	1,929,861.93
Supplies and materials	876,591.66	749,790.07
Prepayments	296.65	1,075.69
Works in process	22.57	....
INVESTMENT:		
Loan to municipality of Antipolo	20,000.00	16,000.00
Total current assets	9,274,885.43	3,289,820.39
FIXED PROPERTY:		
(*a*) Real property and improvements	41,140,879.22	42,018,083.23
Equipment	3,445,561.96	3,498,237.38
(Less depreciation)	(1,120,828.46)	(925,962.26)
	52,740,498.13	47,880,178.74

Liabilities	1922	1923
CURRENT:		
Accounts payable	₱1,250,842.95	₱740,895.10
Accrued leave payable	239,779.82	200,613.83
Undistributed collections	28.45	638.93
Deferred credits to income	6,227.29	19,455.63
Fiduciary fund	....	6,054.40
Insurance reserve	233.09	515.02
CURRENT SURPLUS:		
Motor vehicle special fund, Act 3045	144,834.15	69,082.61
Wireless station buildings and towers	50,156.74	17,811.25
Construction of buildings, etc	1,156,402.02	385,105.66
Maintenance, alteration, and repair of public buildings	168,345.79	169,552.74
Irrigation systems	3,109,791.51	41,500.89
Artesian wells and waterworks	105,669.00	120,371.32
Harbor and river improvement	1,298,793.87	1,022,501.89
Roads and bridges	974,615.39	224,634.69
Telegraph, telephone, cables, etc	769,164.66	256,519.04
Lighthouse, buoys, and beacons	....	14,567.39
Total current liabilities	9,274,885.43	3,289,820.39
PRINCIPAL ACCOUNT SURPLUS:		
Invested in fixed property	43,465,612.70	44,590,358.35
	52,740,398.13	47,880,178.74

STATEMENT OF APPROPRIATION, INCOME AND EXPENSES

Debit	1922	1923
Reversion of unexpended balances of administrative appropriation	₱43,612.76	₱62,636.47
Reversion of receipts	1,182,374.40	783,225.15
Operating expenditures offset by receipts	9,352,296.11	6,809,815.16
Expenditures, administrative appropriation	1,053,837.49	889,167.53
Outlays, purchase of equipment	462.78	3,374.68
Total	11,632,583.54	8,548,218.99

Credit	1922	1923
Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱1,097,913.03	₱955,178.68
Receipts—prime cost	9,352,296.11	6,809,815.16
Receipts—surcharges	1,051,834.36	661,829.83
Receipts—miscellaneous	55,193.72	49,713.09
Gain on supplies sold	2,616.42	1,954.12
Inventory adjustments	2,719.76	747.10
Income from rentals	15,367.45	12,191.43
Sales of fixed assets	975.85	5,726.90
Prior year's credit	53,666.84	51,062.68
Total	11,632,583.54	8,548,218.99

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) DURING 1923

	1922	1923
Principal account surplus, December 31	₱35,110,316.24	₱43,465,612.70
Purchase of equipment (General Funds)	462.78	3,374.66
Fixed property brought into account and purchase of equipment from specific appropriations	8,383,125.12	990,684.80
Equipment acquired by transfer	18,602.75	190,901.56
Equipment found at station including worn-out tires taken into account	3,207.48	1,709.26
Equipment acquired by construction	283.96	....
Total debits	43,515,998.33	44,652,283.00

	1922	1923
Equipment sold	₱968.85	₱5,473.96
Equipment condemned on Insular inventory report, dropped on affidavits, undersold, etc	10,127.92	206,085.39
Fixed assets dropped on account of damages caused by earthquake	....	249.56
Equipment dropped by transfer to provinces and municipalities	13,068.28	13,663.19
Equipment and fixed assets dropped by transfer to other Bureaus	20,382.40	31,177.36
Equipment issued to jobs	69.91	141.41
Depreciation written off	5,768.27	(194,866.23)
Principal account surplus, December 31	43,465,612.70	44,590,358.35
Total credits	43,515,998.33	44,652,283.00

OPERATION STATEMENT, BUREAU OF PUBLIC WORKS

Operating revenue	1922	1923
Rental	₱15,367.45	₱12,191.43
Surcharges	1,051,834.36	661,829.83
Gain on goods sold	2,616.42	1,954.12
Inventory adjustments	2,719,76	747.10
Other service income	109,836.41	106,502.67
	1,182,374.40	783,225.15

Operating expenses	1922	1923
Supervising technical and clerical service—salaries	₱836,998.07	₱710,050.56
Labor	62,795.62	46,413.83
Consumption of supplies and materials	60,788.16	47,536.44
Rental of buildings	24,120.00	23,795.50
Illumination and power service	7,532.71	7,414.09
Traveling expenses of personnel	27,082.91	21,301.49
Repair service	7,375.12	5,937.45
Postal, telegraph, telephone, and cable service	11,271.85	10,105.26
Other expense	16,335.83	19,987.89
Total operating expenses	1,054,300.27	892,542.21
Operating profit	128,074.13	(109,317.06)
	1,182,374.40	783,225.15

SPECIAL APPROPRIATIONS

Name of activities	Appropriations		Reversions of appropriation		Expenditures		Income	
	Act 2997	Act 3060						
	1922	1923	1922	1923	1922	1923	1922	1923
1. Registration and regulation of motor vehicles	₱60,000.00	60,000.00	12,225.07	....	47,774.93	60,000.00	444,834.15	628,978.54
2. Regulation and safeguarding traffic and collection of tolls	7,000.00	9,000.00	....	1.90	7,000.00	8,998.10	41,771.99	37,900.28
3. Benguet auto line	100,000.00	80,000.00	11,292.45	....	88,707.55	80,000.00	112,916.40	105,505.30
4. Los Baños quarry	120,000.00	140,000.00	13,699.85	36,607.07	106,300.15	103,392.93	112,108.38	77,456.23
5. Board of Examiners for Engineers and Architects	2,000.00	2,000.00	....	595.97	2,000.00	1,404.03	850.00	1,060.00
6. Central Garage	....	36,000.00	....	5,177.54	....	30,822.46	....	10,592.25
Totals	289,000.00	327,000.00	37,217.37	42,382.48	251,782.63	284,617.52	712,480.92	861,492.60

The larger results of the year's work

Surfaced roads constructed and designated first-class	Kilometers	158.4
Reinforced concrete bridges and culverts completed	Number	47
(In this figure, concrete pipe culverts are not included)		
Successful deep wells completed	do	71
Reinforced concrete buildings completed, including only buildings of over 100 cubic meters capacity	Number	43
Insular irrigation systems completed (total irrigable area 7,000 hectares)	do	3
Waterworks completed (total population served 14,700)	do	8

Expenditures supervised during the year 1923 as compared with the year 1922

	1922	1923
Total expenditures	₱20,917,114.45	₱15,823,206.01
Total expended upon road and bridge work	6,849,167.54	7,170,870.60
Total expended upon building work	4,706,534.17	2,275,758.26
Total expended upon port work	5,425,020.11	2,506,061.97
Total expended upon water supply	739,294.77	696,887.01
Total expended upon irrigation projects	2,577,468.52	1,885,830.98
Operation of auto line, quarries, and the supervision of motor vehicle traffic	242,782.63	243,392.92
Expenditures on miscellaneous items account for the balance		

ROAD WORK

Road in existence in the various provinces of the Philippines as of December 31, 1923

Province	First-class road	Second-class road	Third-class road	Total road	Trails
	Kms.	*Kms.*	*Kms.*	*Kms.*	*Kms.*
Abra	54.3	18.3	5.8	78.4	98.7
Agusan	17.3	7.6	23.3	48.2	45.7
Albay	184.0	46.3	53.0	283.3	83.5
Antique	104.4	106.6	12.9	223.9	18.5
Baguio	43.2	.7	2.1	46.0	2.2
Bataan	36.8	18.4	2.3	57.5	75.7
Batangas	187.4	19.7	155.5	362.6	38.7
Benguet	75.3	32.9	4.8	113.0	
Bohol	220.0	94.2	11.3	335.5	7.6
Bukidnon		97.0	16.7	113.7	94.5
Bulacan	116.3	138.4	63.9	318.6	
Cagayan	68.6	93.7	18.9	181.2	139.8
Camarines Norte	24.5	7.4	18.8	50.7	3.7
Camarines Sur	137.6	31.4	64.7	233.7	52.1
Capiz	188.6	104.3	12.5	305.4	122.5
Cavite	81.0	32.7	9.8	123.5	106.8
Cebu	308.5	237.6	105.8	651.9	59.7
Cotabato	15.1	1.9	55.0	72.0	256.5
Davao	18.3	6.3	42.6	67.2	596.3
Ilocos Norte	78.4	113.7	6.7	198.8	48.1
Ilocos Sur	174.0	27.4	54.9	256.3	95.1
Iloilo	268.5	54.7	150.7	473.9	8.9
Isabela	81.2	26.9	116.0	224.1	
Laguna	153.6	21.2	57.4	232.2	29.4
Lanao	42.6	17.8	21.7	82.4	259.8
La Union	90.5	35.3	29.2	155.0	9.5
Leyte	120.1	68.0	74.5	262.6	42.7
Marinduque	42.5	.5	21.3	64.3	61.8
Masbate	36.9	4.9	11.9	53.7	
Mindoro	19.0	52.6	6.6	78.2	211.4
Misamis	103.5	98.8	75.5	277.8	145.1
Mountain Province		13.0	251.1	264.1	1,018.9
Nueva Ecija	167.9	42.4	229.0	439.3	
Nueva Vizcaya	37.7	23.2	70.0	130.9	137.7
Occidental Negros	298.3	51.2	187.9	537.4	26.2
Oriental Negros	147.1	18.6	72.5	238.2	183.1
Pampanga	201.1	60.0	96.8	357.9	
Pangasinan	364.1	106.2	185.2	655.5	
Rizal	176.9	16.6	27.9	221.4	16.6
Romblon		9.1	6.7	15.8	278.7
Samar	103.4	46.0	92.2	241.6	38.8
Sorsogon	93.0	60.0	28.1	181.1	
Sulu	20.3	14.8	13.7	48.8	109.6
Surigao	53.6	2.0	5.4	61.0	15.0
Tarlac	117.9	10.2	50.9	179.0	27.3
Tayabas	161.4	37.5	71.1	270.0	
Zambales	43.8	39.4	38.0	121.2	23.4
Zamboanga	61.5	29.3	52.6	143.8	115.5
Total	5,140.7	2,196.7	2,795.2	10,132.6	4,705.1

Tabulation of increase in road kilometerage during 1923 by provinces

Province	Road in existence December 31, 1922	Road in existence December 31, 1923	Increase during 1923
Albay	181.5	184.0	2.5
Baguio	41.2	43.2	2.0
Bataan	34.6	36.8	2.2
Batangas	186.5	187.4	.9
Bohol	207.5	220.0	12.5
Bulacan	103.9	116.3	12.4
Cagayan	62.6	68.6	6.0
Camarines Norte	24.0	24.5	.5
Camarines Sur	137.3	137.6	.3
Capiz	179.8	188.6	8.8
Cavite	75.4	81.0	5.6
Cebu	304.4	308.5	4.1
Cotabato	13.3	15.1	1.8
Davao	12.9	18.3	5.4
Ilocos Sur	170.5	174.0	3.5
Iloilo	266.0	268.5	2.5
Isabela	79.9	81.2	1.3
Laguna	148.3	153.6	5.3
Lanao	40.8	42.9	2.1
Marinduque	41.1	42.5	1.4
Masbate	32.2	36.9	4.7
Nueva Ecija	156.7	167.9	11.2
Nueva Vizcaya	34.2	37.7	3.5
Occidental Negros	285.5	298.3	12.8
Oriental Negros	143.6	147.1	3.5
Pampanga	196.9	201.1	4.2
Pangasinan	352.8	364.1	11.3
Rizal	174.6	176.9	2.3
Sorsogon	85.6	93.0	7.4
Surigao	51.6	53.6	2.0
Tarlac	115.9	117.3	2.0
Tayabas	157.2	161.4	4.2
Zambales	38.6	43.8	5.2
Zamboanga	58.9	61.9	3.0
Total			158.4

Tabulation of increase in road kilometerage during 1923 by provinces—Continued

DEFINITIONS FOR ROAD CLASSIFICATIONS

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing

	December 31, 1922	December 31, 1923
	Kilometers	*Kilometers*
Stone	1,476.6	1,507.1
Gravel	3,323.8	3,398.3
Coral	1,554.2	1,671.4
Unsurfaced	3,685.9	3,555.8
Total	10,040.5	10,132.6

BRIDGES

Durable Bridges and Culverts in Existence

Fiscal year ending—	All durable structures	
	Total number	Increase during the year
June—		
1910	4,372	507
1911	4,842	470
1912	5,177	358
1913	5,654	508
December—		
1913 (6 months)	5,901	190
1914	6,206	305
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	56
1919	7,491	65
1920	7,521	30
1921	7,481	[a] 40
1922	7,562	81
1923	7,586	24

[a] Decrease.

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick, and all substantial stone structures whether of adobe or other material. The increase of 24 structures includes those actually completed during the year as well as those which should have been previously reported minus structures reported missing for the first time. The above figures are obtained from semiannual reports of district engineers.

Reinforced concrete structures in existence

Fiscal year ending—	Total number	Total meters
June—		
1910	(a)	(a)
1911	2,004	7,709
1912	2,350	9,216
1913	2,854	11,224
December—		
1913 (6 months)	3,046	11,984
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280
1922	4,366	17,684
1923	4,400	18,045

[a] No data.

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other classes of construction.

ARTESIAN WELLS

During the first six months of the year 1923, there were, on the average, only seven (7) deep well rigs in active operation, notwithstanding the fact that during the greater part of the time there were twenty-two (22) of these machines in the field. This was due largely to the fact that the 1923 insular appropriations were not released until late in April. The monthly average of machines under operation for the whole year is $8\frac{11}{12}$ against $15\frac{3}{4}$ of last year. This, together with the fact that there were no funds made available for 1923 for the purchase and repair of equipment and spare parts for the old machines which have been in operation since 1904, affected to a considerable extent the record which had been established in previous years. Failure of municipal councils and provincial boards to submit on time proper resolutions requesting the drilling of artesian wells as prescribed in Provincial Circular No. 216 of the Executive Bureau also served to decrease the number of completed wells and at the same time increased the cost of operation for the first six months of the year.

The total number of successful wells drilled by the Bureau of Public Works from 1904 to 1923 is 1,543. This number includes the private wells drilled by the Bureau. These wells are capable of supplying a total of 38,000,000 gallons of potable water per 13-hour day, which at the rate of 20 gallons per person per day of 12 hours, would supply no less than 1,900,000 people daily.

Total expended upon wells

	1923		1922	
	Pesos	Per cent	Pesos	Per cent
Successful wells	167,112.72	84	309,801.11	88
Unsuccessful wells	32,456.70	16	42,318.26	12
Total	199,569.42	100	352,119.37	100

Comparative cost of drilling

[A. INCLUDING THE UNSUCCESSFUL WELLS]

	1923	1922
Per meter	₱29.17	₱31.64
Per foot	8.89	9.64

[B. NOT INCLUDING THE UNSUCCESSFUL WELLS]

Per meter	32.38	35.40
Per foot	9.87	10.79

[A. NOT INCLUDING PRIVATE WELLS DRILLED BY THE BUREAU]

	Number	Total depth in meters	Total flow in liters per minute
Successful—			
Flowing	25	2,610.62	2,967.78
Pumping	40	2,657.87	3,618.97
Total successful	65	5,268.49	6,586.75
Total unsuccessful	12	595.27	....
Grand total	77	5,863.76	6,586.75

[B. PRIVATE WELLS DRILLED BY THE BUREAU]

Successful—			
Flowing			
Pumping	6	840.03	764.66
Total successful	6	840.03	764.66
Total unsuccessful	1	193.24	....
Grand total	7	1,033.27	764.66

Percentage of unsuccessful wells drilled (including private wells): 1923, 14 per cent; 1922, 12 per cent.

ARTESIAN WELL EQUIPMENT AND PERSONNEL

The Bureau has on hand 32 deep well drilling machines, all of which but one, which is the exclusive property of the Province of Bulacan, are owned by the Bureau. Of this number eleven (11) are in good working condition and are equipped with complete attachments; eighteen (18) are lacking in parts, such as, boilers, engines, parts of engines or miscellaneous parts which are either unserviceable or in need of repair, and two (2) are so badly worn out that the cost of repairing them would equal, if not exceed, the cost of purchasing new machines.

Based on reports received from district engineers as to the number of municipalities which have requested the drilling of wells, all the available machines of the Bureau will have to be placed in operation during 1924, provided there are sufficient Insular funds set aside for drilling operations and for the purchase of spare parts.

Drilling operations have also been greatly affected by the resignation of the following personnel:

One general field superintendent and four well drillers, one of whom died.

At the close of the year the field personnel in charge of drilling operations consisted of one acting general field superintendent, one supervising well driller, two acting supervising well drillers, two assistant supervising well drillers, eleven well drillers, two assistant well drillers, and seven junior well drillers. The policy of appointing men with local experience or promoting men already in the service has been adhered to.

There were completed during the year 84 wells with an aggregate depth of 22,439 feet. Of these, 71 wells were successful and can furnish potable water to approximately 67,000 people. At the close of the year 14 wells were being bored and had been drilled to an aggregate depth of 4,333 feet, at a cost of ₱13,977.91.

In point of number of wells drilled, Cebu is again first, with a total of 27 wells completed, 19 of which were successful and 8 unsuccessful. This is explained by the fact that in most localities the water-bearing strata of this province is found at a depth not greater than 100 feet. Pangasinan ranks second, with 10 wells to its credit, all of which have proved successful. Rizal is a close third, with 9 wells to its credit, two of which were unsuccessful.

The largest flowing wells drilled during the year were as follows:

Location	Depth in feet	Size of casing	Capacity in gallons per minute	Date completed
		Inches		
Pangasinan, San Carlos No. 9, near Primary school	450	4½	70–F	Oct. 9, 1923
Bulacan, Calumpit No. 5, near Municipal Building	389	3	60–F	Sept. 20, 1923
Bulacan, Calumpit No. 6, San Jose barrio	386	3	60–F	Nov. 17, 1923
Marinduque, Bautista No. 1, poblacion	341	6	60–F	May 19, 1923
Marinduque, Boac No. 1, Kawit barrio	162	6	50–F	July 27, 1923
Pangasinan, Urdaneta No. 15, Nancalabasaan barrio	125	6	50–F	Sept. 12, 1923
Nueva Ecija, Gapan, No. 14, Santa Cruz barrio	450	6	50–F	Oct. 30, 1923

B. P. W. MACHINE SHOP ACTIVITIES

From January 1 to December 31, 1923, the B. P. W. Machine Shops completed 939 work orders, involving a total sum of ₱76,989.24, as compared with 1,012 work orders completed during the same period in 1922, involving a total of ₱84,759.75. The Machine Shop performed overtime work amounting to 95 days for 1923, as compared with 183 days for the previous year.

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year ending December 31, 1923, there were 1,926 motor vehicles newly registered and 11,763 re-registered for operation, or a total of 13,689 motor vehicles, as compared with 13,406 registered during 1922. There were also 1,140 motor vehicles registered for storage. During this same period, about 2,500 applicants for drivers' licenses were examined and 1,300 new licenses issued. Including renewals, during 1923, 17,042 operators of motor vehicles were licensed.

The results of the campaign conducted during the year for the apprehension of violators of the Motor Vehicle Law are as follows:

Year 1923	Total number of cases reported	Cases for reckless driving		Cases for speeding	
		Number	*Per cent*	*Number*	*Per cent*
First quarter	229	85	37	23	10
Second quarter	146	57	39	37	25
Third quarter	156	32	20	60	38
Fourth quarter	74	21	28	12	16
Total	805	195	....	132	....

Provisions of the Automobile Law most commonly violated

Act 3045:	
Section 26 (*b*)—reckless driving	1,941
Section 26 (*a*)—speeding	132
Section 34—lights	83
Section 20—overloading	111
Section 14 (*h*)—driving without licenses	85
Number of deaths reported during the year	8
Number of licenses suspended during the year	174
Number of licenses indefinitely revoked during the year	1
Amount of fines reported imposed during the year	₱11,535

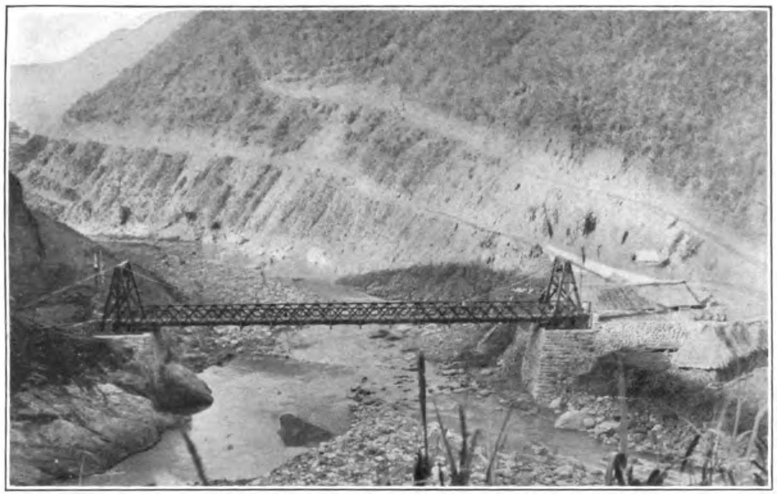
COLLECTION AND EXPENDITURES

The following tabulation shows the yearly amount of funds collected and expended for the registration and regulation of motor vehicles from 1912 to 1923:

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,382.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	528,918.54	60,000.00

BENGUET AUTOMOBILE LINE

The Benguet Automobile Line operated during the year 5 first-class truck busses, 1 third-class truck bus, 1 combined passenger and express truck, 1 fire truck, 3 express and freight trucks, 10 special touring cars, 1 jitney for baggage delivery, and 1 service car for mechanics, and handled during the same period, 3,289 and 141 half-rate first-class passengers, 3,823 and 779 half-rate third-class passengers, 104,600 kilos of hand baggage, 925,905 kilos of express and freight, and 74,843 kilos of dead-head express and freight. The income during the year was ₱105,505.30 and expenditures amounted to ₱80,000 leaving a total gain of ₱25,506.30. No new equipment, however, was purchased and no depreciation charged.



Sabangan Bridge, Cervantes—Bontoc Road, Mountain Province

THE USE OF THE KENNON AND NAGUILIAN ROADS

Traffic over the Kennon Road during the year almost equalled that over the Naguilian Road, notwithstanding the fact that tolls are collected on the former.

A comparative statement of traffic over these two roads for the past three years is given hereunder:

Summary of traffic over the Kennon and Naguilian Roads

KENNON ROAD

Year	Pedestrains	Bullcarts	Animals led or ridden	Calesas	Motorcycles	Automobiles	Trucks	Wagons
1921	20,666	10,831	6,668	1	606	4,728	3,390	85
1922	18,385	11,726	390	2	410	4,403	2,422	38
1923	14,767	9,077	300	....	351	4,796	3,170	100

NAGUILIAN ROAD

Year	Pedestrains	Bullcarts	Animals led or ridden	Calesas	Motorcycles	Automobiles	Trucks	Wagons
1921	16,725	11,052	1,908	40	275	3,704	7,785	55
1922	20,051	13,568	1,792	29	116	4,067	6,172	1,430
1923	22,090	11,318	1,332	16	193	4,562	7,358	754

GOVERNMENT CENTRAL GARAGE

The purpose of establishing a central garage, which began operations about the end of March, 1923, was to provide more economical automobile service for all the Bureaus and Offices of the Government which may require transportation for the performance of official business. With this end in view the Central Garage is kept open day and night. Three drivers are employed for night duty in order to furnish transportation to any authorized Government official who may be in need of same.

The equipment of the Central Garage consists of the following cars: four (4) Fords, three (3) Dodges, two (2) Chandlers, and one (1) Renault.

Twenty-four different Bureaus and Offices of the Insular Government, including the City of Manila, made calls for transportation during the year. Two thousand one hundred and eighty-three (2,183) of these calls were for transportation within the city limits; that is, within a radius of 36 kilometers from Manila. One hundred and four (104) calls were for provincial trips, making a total of 2,287 calls. A great number of the calls received were for Fords and Dodges, especially for city trips. As a rule, the seven-passenger cars (two Chandlers and one Renault) were furnished for provincial trips.

The total income of the Central Garage from March to December 31, 1923, was ₱10,592.45. This amount represents the total rental charges collected from different Government Bureaus and Offices for transportation service furnished.

The total expenditure during the year was ₱30,822.46, divided as follows: for operation, ₱18,851.75 and for repairs, ₱11,970.71.

While the operation of the Central Garage showed an apparent loss of ₱20,230.01 it actually effected a large saving in the cost of providing transportation for the different Bureaus and Offices, when compared with the former arrangement whereby each Bureau or Office operated and maintained its own cars. It should also be borne in mind that the cars assigned to the garage were old cars formerly operated by the various branches of the Insular Government and in order to give satisfactory and efficient service a general overhauling of all cars was necessary.

It is proposed to revise the schedule of rates now authorized during 1924 with a view of placing the operation of the garage on a self-supporting basis.

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Chief Constructing Engineer*

ROADS

During the past year, there were under regular maintenance 5,140.7 kilometers of first-class, 2,196.7 kilometers of second-class, and 2,795.2 kilometers of third-class roads, besides 4,705.1 kilometers of trails, which were under intermittent maintenance. The expenditures for the maintenance of first-class roads alone were ₱4,387,742.20, which gives an average of ₱832.56 per kilometer per annum. As in 1922, the greater part of the Division's activity was directed to maintenance and reconstruction work. Following are tables showing the roads in existence and the average cost of maintenance per kilometer since 1910, which is the first year in which such records were kept:

Roads in existence

Year	First-class designated	Second-class	Third-class	Total	Trails	Total expenditures on road and bridge work
	Kms.	*Kms.*	*Kms.*	*Kms.*	*Kms.*	
1910	916.6	1,344.8	3,337.6	5,599.0	([a])	₱5,290,736.84
1911	1,423.6	1,233.0	2,956.7	5,613.3	([a])	4,551,733.03
1912	1,780.3	2,219.3	3,216.7	7,217.3	([a])	4,546,708.14
1913	2,035.4	2,096.2	3,118.1	7,249.7	([a])	5,370,491.57
1914 (6 months)	2,171.6	2,086.8	3,138.7	7,397.1	378.4	3,680,435.09
1914	2,495.5	2,092.8	2,875.7	7,464.0	915.8	5,652,436.94
1915	3,064.0	2,085.9	3,051.7	8,201.6	518.2	5,872,056.81
1916	3,436.2	2,049.2	5,440.7	8,926.1	3,065.6	5,920,606.95
1917	3,738.7	2,056.6	3,393.6	9,188.9	3,929.6	6,148,213.45
1918	4,090.2	2,015.8	3,128.7	9,234.7	3,942.6	7,257,916.70
1919	4,500.3	1,906.0	3,109.2	9,595.5	3,892.4	8,966,001.55
1920	4,698.8	2,037.5	3,079.8	9,816.1	4,490.2	7,456,498.77
1921	4,836.4	2,044.8	3,036.6	9,977.8	4,414.9	7,177.644.24
1922	4,982.3	2,115.6	2,942.7	10,040.5	4,607.0	6,849,167.54
1923	5,140.7	2,196.7	2,795.2	10,132.6	4,705.1	7,170,870.60

[a] No data.

Caminero system of maintenance

Year	Average kilometers maintained	Cost	Average cost per kilometer per year
1910	963.4	₱549,174.13	₱570.02
1911	1,441.7	709,869.72	492.02
1912	1,785.3	826,972.11	463.20
1913	1,976.3	1,096,854.29	555.00
1914 (6 months)	2,146.3	539,560.88	251.39
1914	2,317.6	1,098,082.54	473.80
1915	2,732.4	1,258,114.15	460.43
1916	3,226.8	1,642,404.93	508.98
1917	3,616.1	2,143,887.68	592.87
1918	4,023.4	2,756,810.70	685.19
1919	4,444.2	3,223,119.18	725.24
1920	4,601.3	3,197,202.28	694.85
1921	4,906.8	3,762,218.99	766.74
1922	5,127.5	4,205,289.25	820.14
1923	5,270.2	4,367,742.20	832.56

Gang system of maintenance

Year	Average kilometers maintained	Cost	Average cost per kilometer per year
1910	([a])	([a])	([a])
1911	2,160.0	₱243,805.39	₱112.87
1912	2,339.0	334,706.84	143.00
1913	2,375.0	302,974.25	127.53
1914 (6 months)	1,700.0	170,652.37	100.45
1914	1,721.7	337,710.66	164.82
1915	2,692.2	396,930.57	147.44
1916	2,800.4	472,129.17	168.51
1917	3,057.0	560,258.92	183.27
1918	2,773.5	589,450.32	212.53
1919	3,152.5	696,440.38	220.92
1920	3,028.1	745,351.19	245.98
1921	3,209.3	746,102.24	233.14
1922	3,389.4	812,501.92	239.74
1923	3,535.6	955,440.21	270.23

[a] No data.

The policy of requiring the provinces to provide adequate sums for the maintenance of the existing roads before funds are appropriated for construction purposes was continued, and resulted in the complete restoration of the 30 odd kilometers of designated first-class roads which had deteriorated below first-class standards. This policy must be insisted upon until more revenues are provided for roads and bridges. As stated in the report for 1922, most of the provinces are dependent upon insular aid to help out their provincial maintenance funds. This is clearly shown in the table opposite, which gives for each province the estimated cost for first-class road maintenance for 1924, the amount of provincial funds available and the maintenance deficit or funds available for new construction.

In 1923, ₱300,000 from Act 3113, section 1, paragraph (*g*), was made available by the Insular Government for the maintenance, reconstruction, and improvement of the Manila–North and South Roads traversing the Provinces of Rizal, parts of Bulacan, Laguna, La Union, and Nueva Ecija, including a portion of the Manila–Tarlac, the Zapote–Cavite, Province of Cavite, and the Pamplona–Pasacao Road, Province of Camarines Sur; the Bangar–Claveria Trail, Province of Ilocos Norte; the Tagudin–Cervantes Trail, Province of Ilocos Sur; and the San Jose–Santa Fe Road, Province of Nueva Ecija.

The construction of new roads will continue to be almost at a stand-still unless more funds are forthcoming. To meet the insistent demands for more roads, this Bureau reiterates its recommendation for the approval of the issuance of bonds by the provinces under Act 2894 as amended by Act 2950, subject to the conditions enumerated in last year's report.

As anticipated at the beginning of 1923, the extent of roads constructed was limited to few projects. The following is a list, accompanied by short descriptions, of the more important roads upon which work has been done:

Construction of Albay–Sorsogon Road. (Provinces of Albay and Sorsogon.) This is an important interprovincial road, 52.33 kilometers long, of which 41.91 kilometers are in Sorsogon and 20.42 kilometers in Albay. The section within the Province of Albay was completed and declared first-class last year. In Sorsogon Province, kilometer 14.3 to kilometer 16 and kilometer 41 have been completed and declared first-class, and first course surfacing has been placed from kilometer 17 to kilometer 27 and from kilometer 35 to kilometer 40. In April, 1923, touring cars were allowed on the entire section, after general repairs were made on the unmetalled subgrade, and temporary bridges and rock fords constructed at stream crossings.

Construction of Loay–Interior Road. (Province of Bohol.) This project contemplates the construction of a road from Loay, kilometer 18, Tagbilaran–South Road to the interior of the province, through

Tagbilaran North Road, Bohol Province

Table showing for each province the estimated cost for first-class road maintenance for 1924

Province	Total provincial road and bridge funds	Provincial funds available for maintenance	Estimate for maintenance	Maintenance deficit	Available for construction
Abra	₱43,904.20	₱26,204.20	₱28,200.00	₱1,995.80	₱14,500.00
Agusan	28,761.20	24,000.00	26,550.00	2,550.00	
Albay-Catanduanes	159,083.80	134,291.30	191,990.00	57,698.70	
Antique	82,771.48	62,000.00	62,000.00		14,500.00
Bataan	32,024.20	27,750.00	47,000.00	19,250.00	
Batangas	141,290.40	116,381.00	160,243.00	43,862.00	5,919.40
Bohol	173,304.98	127,000.00	127,000.00		34,634.98
Bukidnon	10,872.92	9,500.00	35,000.00	25,500.00	
Bulacan	149,198.00	93,600.00	202,000.00	108,400.00	42,000.00
Cagayan	83,241.00	42,000.00	52,600.00	10,600.00	30,741.00
Camarines Norte	36,745.44	25,889.00	28,000.00	2,111.00	6,156.44
Camarines Sur	93,998.00	88,278.00	237,318.00	149,040.00	
Capiz	110,308.16	108,500.00	118,500.00	10,000.00	
Cavite	66,320.28	52,820.28	101,000.00	48,179.72	
Cebu	303,841.00	290,841.00	413,800.00	122,959.00	
Cotabato	40,234.58	18,500.00	26,840.00	8,340.00	18,155.00
Davao	79,981.00	41,000.00	41,100.00	100.00	28,981.00
Ilocos Norte	89,152.00	86,822.00	117,031.00	30,209.00	
Ilocos Sur	159,666.86	100,000.00	106,000.00	6,000.00	41,864.00
Iloilo	233,350.00	220,750.00	265,750.00	45,000.00	
Isabela	60,770.00	38,000.00	48,000.00	10,000.00	17,020 00
Laguna	112,126.00	106,989.00	399,676.00	292,687.00	
Lanao	33,600.00	28,000.00	62,750.00	34,750.00	3,200.00
La Union	77,281.76	58,500.00	78,833.00	20,333.00	11,500.00
Leyte	282,780.00	211,000.00	584,510.00	373,510.00	
Marinduque	33,261.28	27,416.00	27,416.00		3,995.00
Masbate	31,560.00	24,200.00	27,200.00	3,000.00	
Mindoro	34,077.00	32,500.00	32,500.00		500.00
Misamis	99,400.00	95,550.00	157,000.00	61,450.00	
Mountain Province	48,518.72	48,318.72	96,477.65	48,158.93	
Nueva Ecija	158,000.00	153,000.00	170,000.00	17,000.00	
Nueva Vizcaya	33,148.48	24,848.48	51,700.00	26,851.52	5,800.00
Occidental Negros	240,340.96	213,400.00	250,000.00	36,600.00	
Oriental Negros—Siquijor	112,220.00	92,720.00	94,435.00	1,715.00	
Pampanga	158,300.00	124,300.00	220,000.00	95,700.00	
Pangasinan	313,451.48	254,651.48	364,789.93	110,138.45	
Rizal	138,490.32	90,000.00	103,000.00	13,000.00	26,000.00
Romblon	38,401.44	10,000.00	10,000.00		20,000.00
Samar	210,070.00	122,945.00	156,000.00	33,055.00	45,000.00
Sorsogon	58,690.00	53,900.00	101,633.00	47,733.00	
Sulu	47,484.60	41,505.00	33,505.27	(7,999.73)	
Surigao	50,368.92	45,918.92	49,568.92	3,650.00	
Tarlac	102,390.00	78,890.00	90,000.00	11,110.00	
Tayabas	186,558.00	122,021.00	175,507.55	53,486.55	15,000.00
Zambales	43,819.27	35,900.00	43,400.00	7,500.00	
Zamboanga	78,280.74	69,000.00	69,000.00		
Total	4,901,437.97	3,899,600.38	5,884,824.32	1,985,223.94	385,466.82

the town of Carmen. The section under construction is between Carmen and Colonia and has a length of 12.5 kilometers. This road was completed during previous years as first-class up to kilometer 62, beyond Carmen. Five and a half kilometers of road were completed during 1923, making a continuous first-class road up to kilometer 67.5, beyond which first course surfacing has been placed up to kilometer 69 and the subgrade completed to kilometer 70.

Construction of Aparri–South Boundary Road. (Province of Cagayan.) This road will eventually extend from Aparri to the boundary of Isabela Province, but the section under construction was from Aparri to Lal-loc. During the year 1923, the 5 kilometers were completed from kilometer 10 to kilometer 15.

Construction of Noveleta–Amaya Road. (Province of Cavite.) This is a section of the road to connect the municipalities in the southern part of the province, with the capital and has a length of 8 kilometers. During the year 1923, 4.2 kilometers were completed as first-class.

Construction of San Jose–Santa Fe Road. (Provinces of Nueva Vizcaya and Nueva Ecija.) This is one of the most important road projects under construction. It will connect the provinces of the Cagayan Valley with those of Central Luzon. The total length of this road, which is the mountain section of the Cagayan Valley Road, is 58 kilometers, 51 kilometers being in Nueva Ecija and 7 kilometers in the Province of Nueva Vizcaya. During the past year, the subgrade from kilometer 203 to kilometer 218 was completed, and a portion of the road from kilometer 168 to kilometer 173 widened to 6 meters. The entire road was opened to light motor vehicle traffic on November 12, 1923.

Construction of Bayombong–San Luis Road. (Province of Nueva Vizcaya.) This is also a section of the proposed Cagayan Valley Road and connects the Provinces of Nueva Vizcaya and Isabela. This road is 46.3 kilometers in length and when completed, will facilitate the exportation of Nueva Vizcaya products to the Provinces of Isabela and Cagayan. During 1923, 500 lineal meters of kilometer 34, and kilometers 29, 31, and 32 were completed and declared first-class, besides the completion of 280 lineal meters of subgrade in kilometer 30.

Construction of Binalbagan–Himamaylan Road. (Province of Occidental Negros.) This project comprises the surfacing of a section of the Bacolod–South Road from kilometer 67.6 to kilometer 78.5, which was graded several years ago. During the year 1923, 4.8 kilometers were completed and declared first-class.

Construction of Lucban–Mauban Road. (Province of Tayabas.) The final relocation for this road is 31 kilometers in length, and passes through the municipality of Sampaloc, which is 18 kilometers from Lucban and 13 from Mauban. With the ₱50,000 allotted last year, 2 kilometers of the mountain section were completed from kilometer 175 to 176, and 4 kilometers of subgrade, 7 meters wide, were completed on the Mauban end.

BRIDGES

During the year 1923, only six permanent bridges were constructed, costing ₱200,412.78, which is approximately 41 per centum of the amount expended during 1922. This was due to scarcity of funds.

The following is a tabulated description of the bridges, fully or partly completed during the year 1923.

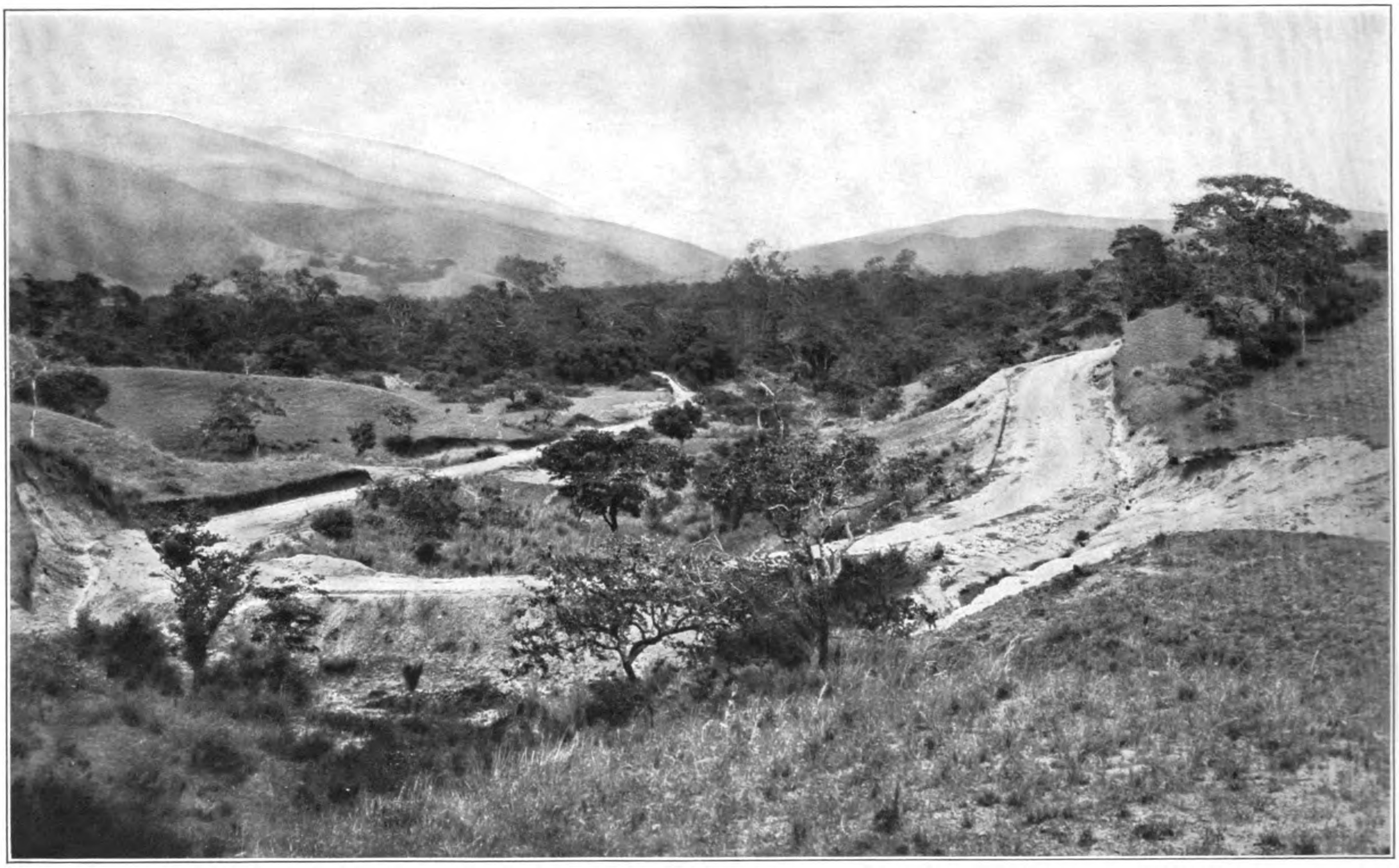
BUILDINGS

Manila.—The Legislative (Insular) Building constituted the most important active building project handled. Mr. John Gordon completed his contract for the concrete work up to and including the second floor slab on August 30th. Electrical conduit work for this portion of the building was installed under contract by Mr. A. G. Hillberg. Advertisement for bids to complete the building could not be published prior to the close of the year, although the necessary funds, viz., ₱2,204,000, were available.

The south wing and lobby of the new Chemical Laboratory for the University of the Philippines was completed in August, under contract, by Mr. R. Agcaoili. Contract was let late in the year for the

Important permanent bridges partially or completely constructed during the year 1923

Province and road	Name	Bridge and Km. No.—	Type	Span	Roadway	Percentage of work done	Total and partial cost
Albay:							
Legaspi-Agus Road	Boranguit Bridge	42.1	Concrete girder	3-9 m.	4.88 m.	100	₱28,047.39
Bohol:							
Tagbilaran-Panglao Road	Dauls Bridge	2.7	Wooden lift	115 ft.	2.84 m.	100	29,365.36
Mountain Province:							
Bontoc-Cervantes Road	Sabangan Bridge	466.8	Wooden suspension	150 ft.	9 ft.	100	29,330.00
Tayabas:							
Manila-South Road	Lagnas Bridge		Steel truss, concrete floor	100 ft.	4.88 m.	100	50,005.43
Camarines Norte:							
Daet	Daet Bridge	6.56	Howe truss, side walk	3-50 ft.	2.84 m.	75	2,396.88
Bulacan:							
Manila-North Road	San Miguel Bridge		Howe steel truss	90 ft.	14 ft.	100	51,267.72
Grand total							200,412.78



Zigzag on kilometer 182, San Jose-Santa Fe Road, Nueva Ecija

north wing of this unit. The new Engineering Laboratory for the University was completed, by the erection of the south wing, under contract, by the Insular Saw Mill, Inc.

A new money vault was constructed for the Philippine National Bank, the work being done by the Mas Construction Co., under contract.

Two animal houses and laboratories, combined, were constructed for the College of Medicine and Surgery, University of the Philippines. These are wooden structures, with necessary water, gas, and sewer connections to make them complete units.

A marked improvement in the quality of concrete produced in building construction at Manila has been made during the year, due to strict enforcement of the new specifications and consequent greater personal interest by the contractors in mixing and placing this material.

Maintenance, alterations, and repair of Insular buildings in Manila and its environs were carried on by the Central Office as heretofore, while provincial work was delegated to district engineers or the officer in charge of the station. With the same amount available as last year for this work, it was impossible to accomplish all the repairs necessary. A start was made on the repair of the Bureau of Agriculture buildings at Pandacan. The cattle sheds have been in bad shape for some years, due to *anay* and dry-rot attacks on the roof frames. A few of the worst cases were repaired and also the roof frame of the superintendent's quarters. A much needed addition to the document vault of the Land Registration Office was constructed. Numerous repairs and alterations were found necessary after the new Nurses' Home at the Philippine General Hospital was put in service. Much of this was due to the need of renewing or replacing hardware, or because of shrinkage of lumber.

The main wiring of the Philippine General Hospital was thoroughly overhauled. The increased efficiency of the light and power system, protection of the Bureau of Science generators, and reduced cost for power supplied the hospital, amply justify the cost of this work.

Extensive alterations were made in the Oriente Building for the Bureau of Lands and it seems imperative that more adequate quarters be found for that Bureau.

Work was started on the transfer of the Property Division of this Bureau to the North Bodega, on the Port Area. The Central Garage is well housed in the same building. Lack of funds prevented the transfer of the entire division and demolition of the old buildings.

Approximately ₱88,941 of the total available was expended for repair of insular buildings outside of Manila. The largest item of this amount was for the upkeep of insular property at Baguio.

Provinces.—Following is a description of the most important public buildings constructed in the provinces during 1923:

Tarlac Provincial Hospital. (Province of Tarlac.) The project consisted in remodelling an old school building, Bureau of Education Standard Plan No. 7, measuring 31.22 meters by 39.20 meters. The remodelled building has a capacity of 53 beds and contains all the conveniences of a modern hospital plant. The building was completed at the end of 1923 at a total cost of ₱26,206.04, financed with insular, provincial, and municipal funds, and some voluntary contributions.

La Carlota School Building. (Province of Occidental Negros.) This is a 1-story standard school building, Plan No. 20 of the Bureau of Education, measuring 35.20 meters by 51.30 meters. The project comprises the construction of 14 rooms only and was completed early in the year, at a total cost of ₱63,999.06

Ilagan Provincial High School. (Province of Isabela.) This is a Standard Plan No. 20 of the Bureau of Education. The following have been accomplished during the year 1923: (1) roofing of the main hall, (2) completion of the west wing, with the exception of the painting, and (3) placing of the flooring and ceiling joists of the east wing. This building is now 70 per cent completed, with a total expenditure of ₱114,252.01.

Camalig Presidencia. (Province of Albay.) The "Gumaca" type of presidencia building was adopted for the municipality of Camalig. It is a 2-story structure. The first story is of concrete and measures 8.60 meters by 18.50 meters. The second story is built of wood and measures 10.30 meters by 20 meters. The building was completed on April 14, 1923, at a total cost of ₱21,925.07.

Guimbal Presidencia Building. (Province of Iloilo.) This building is also of the "Gumaca" presidencia type. It was constructed under contract by Mr. Monico Puentevella of Bacolod, Occidental Negros and completed in February, 1923, at a total cost of ₱25,269.21.

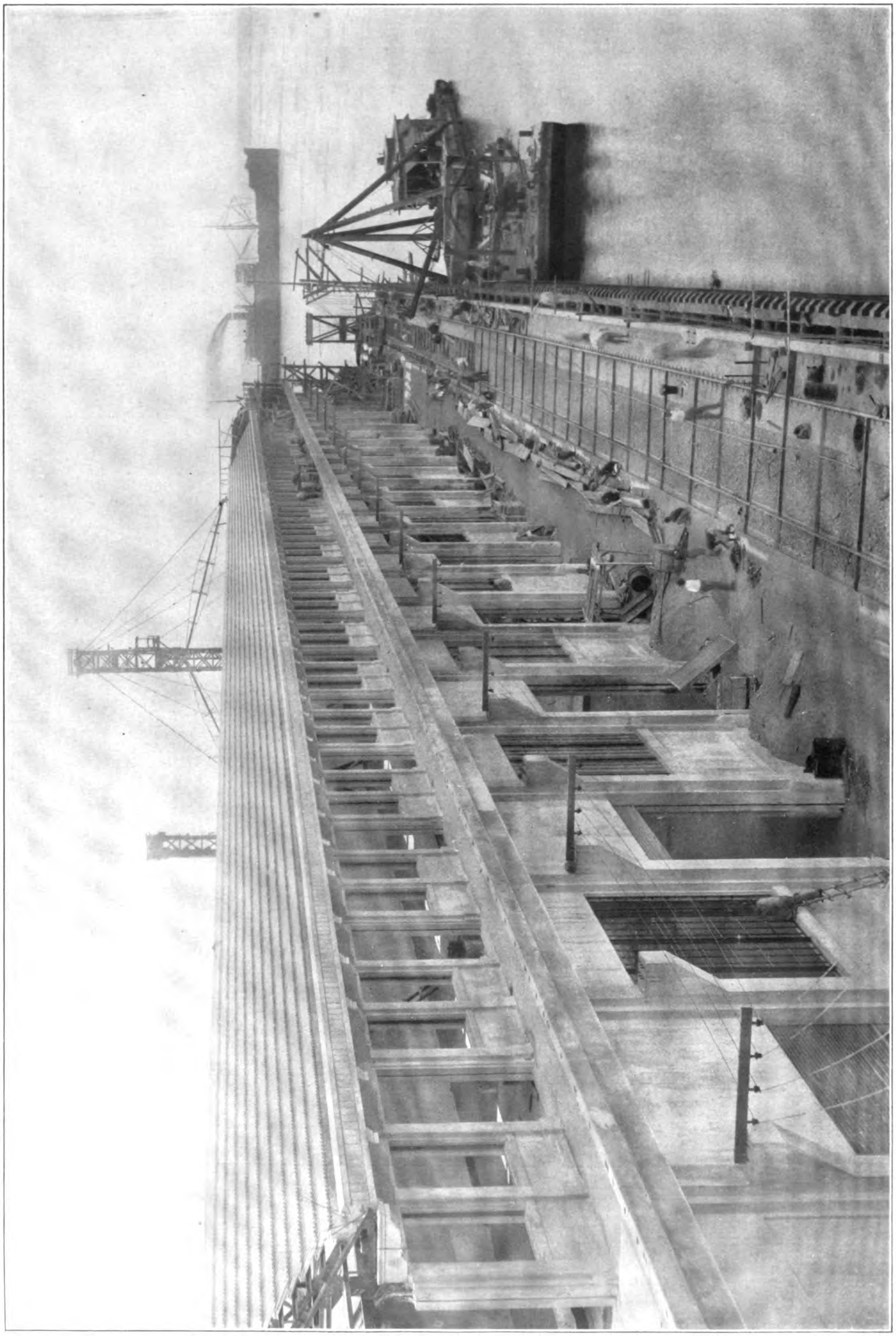
Tuguegarao Constabulary Barracks. (Province of Cagayan.) This building is a Bureau of Public Works Standard Plan, 11 meters by 45.60 meters. It is provided with two concrete porches, 7 rooms, and quarters for the soldiers, in addition to the hospital section which contains 4 rooms and toilet. It was completed at a total cost of ₱46,784.64.

Stringency of funds continued to affect the usual school, market, presidencia, hospital, and miscellaneous building construction in the provinces, with the result that only 88 permanent buildings were completed during the year 1923, as compared with the total of 106 in 1922. The following tables show, by provinces and municipalities, the number and types of buildings completed last year:

Lagnas Bridge, Manila-South Road, Tiaong, Tayabas

HOSPITALS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Floor area (sq. m.)	Cost
Occidental Negros	San Carlos	Emergency ward	Wood with nipa roof	6.00×10.00	320	60	₱1,868.31
Do	Kabankalan	do.	do.	6.00×10.00	320	60	1,860.31
Do	Hinigaran	do.	do.	6.10× 6.10	260	37	978.00
Do	Bacolod	Puericulture	do.	16.00×29.20	2,481	....	11,152.81
Do	Cadiz	Emergency	Wood with certainteed roof	10.10×12.10	292	22	1,061.48
Rizal	Antipolo	do.	Wood with G. I. roof	8.00×10.00	117	98	5,209.33
Tarlac	Tarlac	do.	Concrete with G. I. roof	31.20×39.20	3,981	634	26,206.04



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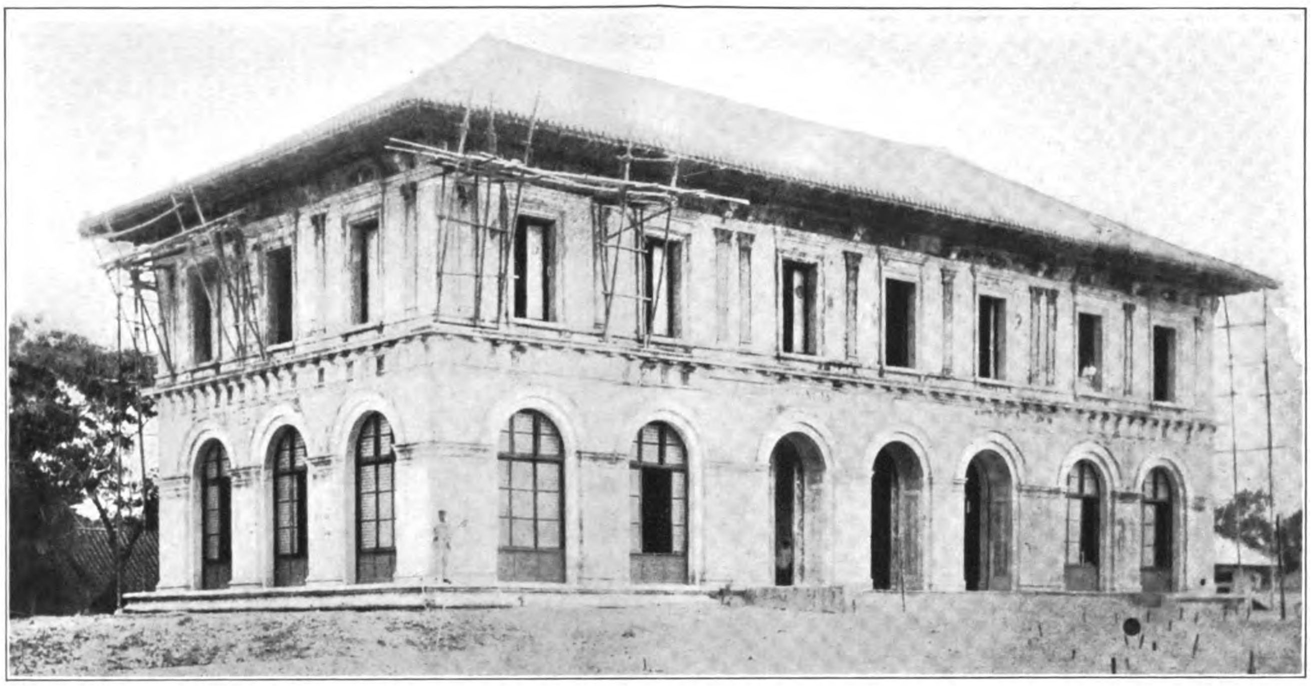
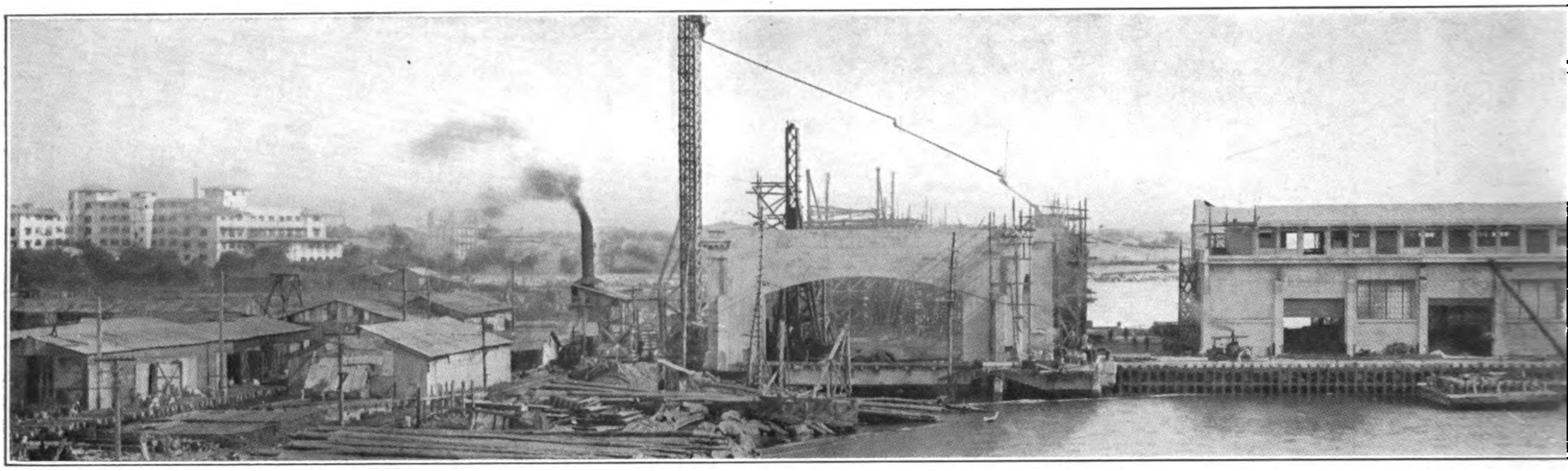


Provincial Building, Laoag, Ilocos Norte

SCHOOL BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Albay	Malinao	1	Wood with G. I. roof (Domestic Science)	14.10×17.30—1-story	1,369	₱14,458.50
Antique	Dao	1	....do	7.20×11.95—1-story	468	4,754.41
City of Baguio		1	Concrete and wood with G. I. roof (Special plan).	13.80×29.40—2-story	6,038	66,948.76
Bohol	Tagbiiaran	Add. rooms	Concrete and wood with G. I. roof (Pasig type).	11.80×17.10—1-story	1,360	17,459.70
Bukidnon	Dalirig	1	Wood with G. I. roof (Plan No. 2)	9.10×14.10—1-story	802	5,915.10
Bulacan	Bustos	1	Wood with G. I. roof (Plan No. 4)	9.20×18.00—1-story	1,962	17,785.59
Do	Bulacan	1	Wood with G. I. roof (Plan No. 10)	12.20×20.80—1-story	3,651	37,241.50
Do	Malolos	1	....do	12.20×20.80—1-story	3,651	33,573.24
Do	Marilao	1	Wood with G. I. roof (Plan No. 5)	10.25×27.70—1-story	1,274	13,500.00
Do	Hagonoy	Add. rooms	Concrete and wood with G. I. roof (Plan No. 7).	12.20×20.80—1-story	2,888	18,894.93
Do	Pulilan	1	Wood with G. I. roof (Plan No. 7)	12.20×20.80—1-story	2,888	27,200.00
Cagayan	Enrile	1	Concrete and wood with G. I. roof (Plan No. 7).	14.20×39.20—1-story	1,544	19,724.33
Cebu	Dumanjug	1	Concrete and wood with nipa roof (Plan No. 20).	11.80×42.40—1-story	5,854	21,343.17
Cotabato	Cotabato	2 add. rooms	Wood with G. I roof (Plan No. 7)	9.00×14.00—1-story	793	4,386.19
Iloilo	Santa Barbara	1	Wood with G. I. roof (Domestic Science)	10.00×12.00—1-story	788	3,407.40
Do	Molo	1	Wood with G. I. roof (Plan No. 5)	9.00×54.00—1-story	3,654	13,840.00
Laguna	Majayjay	1	Concrete and wood with G. I. roof (Plan No. 7).	14.20×39.20—1-story	3,855	37,515,21
Isabela	Angadanan	1	Concrete and wood with G. I. roof (Plan No. 6).	14.20×32.20—1-story	2,558	40,666.51
Laguna	Alaminos	3 add. rooms	....do	12.80×21.20—1-story	1,758	13,478.23
Do	Rizal	1	....do	14.20×39.20	3,855	23,978.12
La Union	Balaoan	1	Concrete and wood with G. I. roof (Plan No. 10).	18.40×42.40	4,259	37,590.26
Masbate	Baleno	1	Wood with G. I. roof (Plan No. 2)	9.20×14.20—1-story	1,033	10,459.92
Mindoro	Looc	1	Wood with G. I. roof	9.52×12.00	754	3,296.68
Occidental Negros	Saravia	1	Wood with G. I. roof (Plan No. 5)	13.50×36.00	2,472	25,859.76
Do	La Carlota	1	Concrete and wood with G. I. roof (¾ Plan No. 20).	35.20×51.30	8,841	63,999.06
Do	Dansalan	1	Wood with G. I roof (Plan No. 4)	9.00×32.00	1,666	9,394.26
Do	La Carlota	1	Wood with G. I. roof (Domestic Science)	8.00×13.00	570	3,529.21
Do	Bacolod	2 add. rooms	Concrete and wood with G. I. roof (Plan No. 7).	11.30×14.00	839	8,905.15
Do	Bago	2 add. rooms	Concrete and wood with G. I. roof (Plan No. 7).	11.30×14.00	639	8,583.42
Do	Cadiz	4 add. rooms	Concrete and wood with G. I. roof (Plan No. 6).	11.25×28.00	1,982	18,914.55
Do	San Enrique	1	Wood with G. I. roof (Plan No. 10)	12.20×28.40	1,672	13,555.92
Do	La Castellana	1	Wood with G. I. roof (Plan No. 20)	28.00×73.70	6,064	28,607.45
Pangasinan	Tayug	1	Concrete and wood with G. I. roof (3-5 Plan No. 5).	11.80×21.10	1,773	13,165.29
Do	Alcala	1	Concrete and wood with G. I. roof (Plan No. 2).	9.20×18.10	1,301	6,597.05
Do	San Jacinto	1	Concrete and wood with G. I. roof (Plan No. 4).	9.20×32.20	2,226	15,481.95
Do	Malasiqui	5 add. rooms	Concrete and wood with G. I. roof	11.80×35.00	2,972	18,767.13
Do	Calasiao	1	Concrete with G. I. roof (Plan No. 7, 2 additional rooms.	14.20×39.20	5,474	40,208.45
Do	Burgos	1	Concrete with G. I. roof (Plan No. 4)	9.20×32.20	2,226	16,104.64
Do	Bani	1	Concrete with G. I. roof (Plan No. 7)	14.20×39.20	3,702	28,247.51
Do	Aguilar	1	Concrete with G. I. roof (Plan No. 4)	9.20×32.20	2,226	15,861.28
Do	Lingayen	1	Wood and sawale (Plan No. 10)	11.20×21.20	6,386	27,507.68
Do	Alaminos	1	Concrete with G. I. roof (7 additional rooms)	12.67×42.11	3,455	25,863.48
Do	Anda	1	Concrete with G. I. roof (Plan No. 4)	9.20×32.20	2,226	16,495.32
Rizal	Pasay	1	Concrete with G. I. roof (Special plan)	10.80×38.20	15,720	238,302.11
Do	....do	1	Wood with G. I. roof (Domestic Science)	7.00× 9.00	403	2,978.39
Romblon	Romblon	1	Concrete with G. I. roof (2 addional rooms Plan No. 7).	7.00×18.00	948	7,997.85
Sorsogon	Pilar	1	Concrete with G. I. roof	14.20×39.20	3,128	25,694.50
Zambales	Santa Cruz	1	Concrete with G. I. roof (Plan No. 7)	14.20×39.20	3,659	11,249.11



PIER No.

In addition to the school buildings listed on the preceding page, the following temporary buildings were also constructed during the year:

TEMPORARY SCHOOL BUILDINGS

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Iloilo	La Paz	1	6-room temporary wood and nipa	8.50×54.00	3,179.0	₱6,000.00
Do.	Iloilo	1	3-Additional room temporary wood and nipa.	8.50×18.00	1,279.0	2,400.00

PRESIDENCIAS

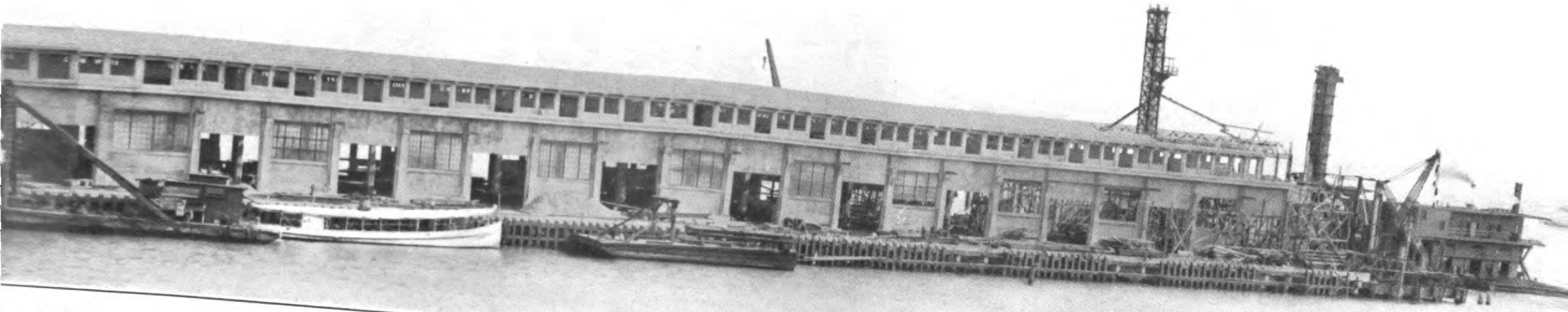
Province	Municipality	No. of buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Floor area (sq. m.)	Cost
Albay	Camalig	1	2-story—Concrete and wood with G. I. roof.	8.60×18.30	1,619	178	₱21,925.07
Batangas	San Luis	1	.....do	8.10×16.10	1,391	268	13,350.00
Camarines Sur	Boac	1	.....do	8.10×16.10	1,391	268	15,248.54
Iloilo	Guimbal	1	Special design—Concrete and wood with G. I. roof	8.60×18.80	1,431	315	25,269.21
La Union	San Fernando	1	Concrete and wood with G. I. roof	5.20×13.50	406	66	5,841.48
Occidental Negros	Murcia	1	Wood and G. I. roof	10.00×12.00	1,056	140	8,558.35
Rizal	Muntinlupa	1	.....do	7.20×14.20	766	108	6,771 58

MARKET BUILDINGS AND TIENDAS

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Floor area (sq. m.)	Cost
Bataan	Orani	1	Concrete with G. I. roof	15.00×31.00	2,302	465	₱11,059.32
Bohol	Calape	1	Concrete with G. I. roof (matadero)	8.90×12.20	554	108	4,040.11
Bulacan	Hagonoy	1	.....do	12.00×16.50	668	324	5,954.08
Ilocos Norte	Dingras	1	Concrete with G. I. roof	21.00×39.80	836	459	10,194.69
Iloilo	Passi	1	Concrete with G. I. roof (tienda)	8.00×21.30	170	706	4,800.00
Mountain	Bontoc	1	Stone and brick, G. I. roof	5.00×47.50	237	950	7,206.24
Do	Bontoc (Market exchange)	1	.....do	11.40×19.30	1,443	220	3,800.00
Tayabas	Tayabas	1	Concrete with G. I. roof (tienda)	5.00×13.50	301	68	5,402.28

MISCELLANEOUS BUILDINGS

Province	Municipality	No. of buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
City of Baguio	(Cottage)	1	Wood with G. I. roof	10.97×13.41	681	₱6,234.13
Do.	.....do	1	.....do	7.92× 9.75	297	2,938.96
Do.	(Refrigerator)	1	Wood with wooden roof	5.00×10.00	200	2,073.17
Cagayan	Tuguegarao (Constabulary barracks).	1	Concrete and wood with G. I. roof	22.80×45.60	3,592	46,738.64
Cebu	Mandawe (toilet, bath, radio station)	1	.....do	4.40× 5.40	82	2,261.07
Davao	Davao (cottage and garage)	1	Wood with G. I. roof	8.80×11.58	637	4,500.00
Do.	Davao (nurses' dormitory)	1	Concrete and wood with G. I. roof	18.30×19.50	2,179	30,000.00
Do.	Davao (doctors' cottage)	1	.....do	7.92× 9.14	455	4,000.00
Do.	Davao (morgue)	1	.....do	3.05× 4.27	57	400.00
Do.	Davao (leper house)	1	.....do	6.71×12.19	350	3,000.00
Do.	Davao (provincial treasurer bodega)	1	Wood with G. I. roof	6.00×12.00	396	2,047.18
Iloilo	Santa Barbara (bath)	1	Concrete and wood with G. I. roof	4.00× 6.00	96	1,239.13
Do.	Iloilo (lepers' cottage)	1	Wood and nipa with nipa roof	6.15× 8.15	359	1,000.00
Do.	Iloilo (garage)	2	Wood with G. I. roof	3.20× 6.20	201	712.40
Manila	(Chemical Laboratory)	1	Concrete with G. I. roof	13.00×46.00	4,368	103,000.00
Do.	Nurses' dormitory	1	Concrete and wood with tile roof	21.90×44.55	26,340	720,000.00
Mountain	Bontoc (contagious disease pavilion)	1	Stone, brick, and wood with G. I. roof	7.50×22.50	1,239	12,598.88
Nueva Ecija	Cabanatuan (court house)	1	Concrete and wood with G. I. roof	12.00×15.00	1,726	24,200.00
Rizal	Antipolo (refuse incinerator)	1	Concrete with G. I. roof	10.00×10.00	733	3,495.13
Tarlac	Tarlac (cottage)	1	Wood and sawale with nipa roof	6.00×14.50	335	1,486.72
Do.	Tarlac	1	.....do	6.00×14.50	335	1,486.72
Tayabas	Lucena (cottage)	1	Wood with G. I. roof	10.00×12.00	985	7,025.48
Do.	Lucena (court house)	1	Concrete with G. I. roof	18.90×29.40	6,149	58,831.99
Do.	Lucena (outhouse)	1	.....do	2.80× 6.40	46	3,636.97



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The following tabulation shows the number of durable buildings constructed from 1909 to December 31, 1923, their cubical and costs.

Year	Number of buildings completed				Total number of all durable buildings	Total content cubic meters	Per cent reinforced concrete by content	Expend buildings buildin construc mainten buil
	Schools	Markets and tiendas	Hospitals	All other durable buildings				
1909	15	....	2	20	37	No data....	No data....	₱1,9
1910	....	....	....	44	44	No data....	No data....	1,6
1911	56	....	10	92	158	206,368	64	2,9
1912	98	9	3	71	181	255,640	72	2,6
1913	88	15	....	41	144	409,025	85	1,8
1914 (6 months)	25	25	....	4	54	184,160	92	1,4
1914	69	51	1	15	136	370,723	92	2,7
1915	72	54	4	24	154	522,746	76	2,4
1916	67	17	1	27	112	261,496	85	2,0
1917	32	15	2	33	82	160,888	70	2,0
1918	27	19	2	36	84	220,943	56	2,7
1919	19	11	1	45	76	159,254	64	4,7
1920	47	12	3	20	82	229,653	65	5,9
1921	79	25	3	41	148	363,735	71	6,7
1922	49	15	1	46	111	314,014	88	4,2
1923	50	8	3	27	88	212,485	70	2,2

PORT WORKS CONSTRUCTION, IMPROVEMENT, AND SEASHORE PROTECTION

Manila.—(See Designing Division's report.)

Cagayan.—An investigation was made during September, 1923, by a committee composed of three Bureau engineers, of the proposed seashore protection work for the municipality of Aparri to prevent further encroachment by the sea. The committee found that the sea continues to encroach on the town at the rate of from 10 to 15 meters a year, and recommended the construction of a permanent sea wall, approximately one kilometer in length, and pointed out in its report that the additional groins contemplated by previous plans with a view to building up the shore were not necessary, as the town has ample room to extend on two sides. The sum of ₱55,000 was made available for the work and an additional appropriation has been recommended for next year to continue construction so that the principal part of the town will be protected.

Romblon.—This is a reinforced concrete deck-girder type wharf, 9 meters by 11.40 meters, supported by reinforced concrete piles and replaces the old wooden wharf. The only work done prior to 1923 consisted of the driving of 20 piles, and during this year the wharf was brought to completion at a total cost of ₱22,922.78.

Leyte.—Repair work consisting of placing 25 back stays was undertaken in connection with the Tacloban wharf. A contract for the work was awarded to Mr. Louis Chapman on September 18, 1923, for ₱17,553.08.

Zamboanga.—The work accomplished during 1923 consisted in changing terredo-eaten piles, worn-out flooring and rotten stringers; the installation of concrete fender piles behind the concrete wharf; and the installation of wooden fender piles for the protection of the rest of the structure. The sum of ₱14,582.13 was expended on the above-mentioned items.

Iloilo.—In Iloilo, the dredging of the lower reach of the Iloilo was undertaken with a view to providing a channel with a de 26 feet below mean low water. During the year 1923, some cubic meters of mud and sand were dredged at an average ₱0.375 per cubic meter. The dredging operations were suspended October 16, 1923, due to lack of funds.

PORT WORKS MAINTENANCE

The steamship *Dredger* lost but little time for overhauling repair and is in good condition, except that the pumps requir usual repair of liners and bearings. This vessel is rather small the needs of the port of Manila, where the vessels now calling d more than thirty feet. If it can be done, a larger sea-going dr should be acquired, to permit the deepening of the harbor to thi five feet.

A new steel, self-dumping scow was purchased by contract from Earnshaw's Docks and Honolulu Iron Works, Inc. It was fabrica in the United States and brought out knocked-down. It is even perior to the one built by the Atlantic Gulf and Pacific Company a the workmanship is strictly first-class.

Arrangements were made to bring Dredge No. 4 to Manila at t close of the year for general overhauling. This equipment has be afloat since it was launched, due to absence of docking facilities i the Southern Islands. Consequently, it must be anticipated tha costly repairs will be necessary. The performance of this dredge a Iloilo demonstrated that economical work can be done if the ma terial is at all suitable. The average cost of dredging at Iloilo was about 37 centavos per cubic meter, including all charges for repairs, towing, etc.

The ladder dredges were alternately put in service, to secure uninterrupted dredging while repairs were made. Dredge No. 1 did most of the work, however, and Dredge No. 2 was idle because of lack of scows.

The launch *Resolute* was delivered by the contractors, El Varadero de Manila, late in the year and has not yet been put in service because of adjustments required by the type of engine installed. This launch is excellently built, first-class materials and workmanship only having entered into its construction. It is a heavy towing unit, for work in the harbor and at sea.

Throughout the year, accurate surveys of Manila water ways were made and estimates based on definite knowledge of the amount of material to be dredged were prepared. This has had a beneficial effect on the dredging crews, and enabled the Bureau to promptly attend to the more urgent dredging requirements. It also made it possible to contract the disposal of dredge spoil from the esteros. This was accomplished by contracting the hauling away of the material, this Bureau furnishing a free tow, within prescribed limits. The survey force measured the material in place in the *bancas* of the contractors, payment being made on a cubic meter basis. All of the estero dredging was accomplished either in this manner, or by agreement whereby those directly benefited paid for the cost of disposal. These two methods have the great advantage that the contractor has to find a land-filling job to enable him to make a profit, the sanitation of the city being consequently improved.

A total of about ₱90,000 was expended for the maintenance of Piers Nos. 3 and 5, the cargo Sheds and the Pasig River and Estero walls. The work consisted of a wide variety of items, ranging from repair of galvanized iron roofing, painting the steel superstructure of the piers and repair of the cargo-shed concrete, to repair of undermined river walls and broken mooring posts. The repair of the quarantine station structures at Mariveles and the matadero at Siman were attended to.

The following tabulation indicates the scope of dredging work done in 1923 compared with the work done in 1922:

Dredging operations, 1923

Location	Total, 1902 to 1922	Total for 1923	Steamship *Dredger*	Dredges							Total
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	
	Cu. m.	*Cu. m.*									*Cu. m.*
Lower Pasig River	7,024,740	248,850	61,500	132,749	54,601						7,273,590
Outer Harbor	3,258,819	368,000	368,000								3,626,819
Upper Pasig River	988,316	15,744							5,681	10,063	1,004,060
Inner Basin	480,179	50,000	50,000								530,179
Binondo Estero	52,816	17,373						17,373			70,189
Estero de la Reyna	234,663										234,663
Paco Estero	38,109										38,109
San Miguel Estero	59,285										59,285
Provisor Estero	27,744	3,937							3,937		31,681
Marine Railway Engineer Island	41,809	2,958				2,958					44,767
Talim Island (City)	1,071										1,071
Outer Bar	1,191,335	112,719		85,389	27,360						1,304,054
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580										16,580
Engineer Island Canal	30,180										30,180
Vitas Estero	378,517	14,458				14,458					392,975
Quiapo Estero	12,507										12,507
Segada Estero	35,509										35,509
Pandacan	172										172
San Lazaro Estero	22,975										22,975
Corregidor Harbor, Quartermaster	54,956										54,956
Iloilo River	2,129,117	290,903					290,903				2,420,020
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	28,920										28,920
District of Cavite	20,876										20,876
Tondo Beach	9,013										9,013
Santibañez Estero	24,216										24,216
Tanque Estero	25,176	2,881						2,881			28,057
Tacloban Wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato River	49,462										49,462
Earnshaws Slipways	33,113	22,000	22,000								53,113
Los Baños Pier	2,149										2,149
United States Navy, Cavite	716,920	33,000	33,000								749,920
Concordia Estero	1,823	8,224							8,224		10,047
Malabon Canal		36,821				36,821					36,821
Port Libas, Capiz		26,490					26,490				26,490
Totals	17,627,198	1,254,358	534,500	218,108	81,961	54,237	317,393	20,254	17,842	10,063	18,881,556

WIRELESS STATIONS

In view of the lack of funds no new wireless station construction was undertaken during 1923. However, a considerable sum was expended for maintenance and reconstruction of the various radio stations scattered throughout the Islands. Most of this work was necessary because of the temporary character of the buildings previously constructed. It is certain that heavy expenditures will be required for the upkeep of these structures in the future, and it appears desirable to replace them with more permanent construction as rapidly as possible. Below is a list of some of the stations repaired last year:

Santo Domingo de Basco Station. (Province of Batanes.) The sum of ₱24,920.73 was expended for the reconstruction of the steel tower, and ₱10,000 for the repairs of the power house and outhouses.

Davao Station. (Province of Davao.) The sum of ₱1,600 was expended for the construction of one additional room and one outhouse.

Cuyo Station. (Province of Palawan.) The sum of ₱2,584 was expended for repairing the steel tower, the power house and the outhouse.

Iloilo Station. (Province of Iloilo.) The sum of ₱863.69 was expended for repairing the steel tower and the roofing of the operating house.

TELEPHONE SYSTEMS

The Province of Zambales constructed 46 kilometers of telephone lines between the municipalities of Palauig and Santa Cruz at an average cost of ₱54.17 per kilometer.

Nueva Vizcaya, with the completion of its 201 kilometers of telephone lines at a cost of ₱38.07 per kilometer, can claim the advantage of reaching all its municipalities by telephone.

In the Mountain Province extensive repair work was undertaken and 103 kilometers (mostly on the Baguio–Bontoc line) were reconstructed at a cost of ₱37.30 per kilometer.

Cainta Municipal Building, Cainta, Rizal

LIGHTHOUSE CONSTRUCTION AND REPAIR

The major repair work on the upkeep of lighthouse structures during 1923 was as follows:

Name of station	Location	Work accomplished	Cost
Capitancillo	Cebu	Repair roof, gallery, windows, doors, pipes for rain water; and painting building and tower.	₱7,750.00
Punta Pata	Cagayan	Repair toilets, doors, windows, and glass panes of the tower.	1,997.00
Bojeador	Ilocos Norte	General repair of windows, doors, floor, and roof.	2,077.00
Subic	Zambales	Repair of tower, house roof, floor, walls, door frames, shieve, boat house, flag pole, and general painting.	3,353.00
Donsol	Sorsogon	Construction of one cement tower, standard beacon, 30 feet high.	5,236.00
Mati	Davao	Construction of one cement tower, standard beacon, 30 feet high.	5,153.00
Miscellaneous lighthouses.			8,337.00
Basco	Batanes	Repairs radio station	4,000.00
		For acquisition of land, Port Sula lighthouse.	2,116.00
Total			40,019.00

Funds were set aside for the construction of a new keepers' quarters for the San Fernando (La Union) lighthouse, the old building being deteriorated beyond further repair.

A total of ₱100,000 was expended on lighthouses, of which the sum of ₱45,000 was used by the Bureau of Commerce and Industry for upkeep of buoys, beacons, and lamp mechanisms. In compliance with judgment of the court, the sum of ₱2,116 was paid for the land on which the Port Sula lighthouse is located.

Attention is particularly invited to the appended tabulation showing the relative proportion of Christian and non-Christian employees in the specially organized provinces during the past year. In general it may be stated that no non-Christian has become capable of performing the duties of foreman, and that, while a large number have been employed as *capataces*, none of them can be intrusted with standard bridge and building construction. Lack of education and training is the greatest handicap for the non-Christians and while many of them were employed as laborers and were entirely satisfactory in that capacity, it is evident that some time must elapse before they can be utilized as foremen.

Name of provinces	Foremen		Capataces		Laborers		Remarks
	Non-Christians	Christians	Non-Christians	Christians	Non-Christians	Christians	
Baguio, Benguet	0	7	5	23	280	135	Average (daily).
Cotabato	0	2	4	2	85	30	Do.
Davao	0	5	1	17	26	500	Do.
Lanao	0	0	4	4	29	8	Do.
Misamis (Bukidnon)	0	4	13	15	553	376	Maximum (daily).
Mountain	0	3	71	44	1,229	31	Average (daily).
Nueva Ecija	0	0	8	49	184	1,091	Do.
Nueva Vizcaya	0	4	2	14	25	128	Do.
Sulu	0	3	4	12	208	54	Do.
Surigao (Agusan)	0	1	0	17	11	255	Do.
Zamboanga	0	5	0	8	54	303	Do.
Totals		34	112	205	2,684	2,911	

DESIGNING DIVISION

E. G. EARLE, *Chief Designing Engineer*

Permanent materials of construction were employed in practically all structures designs during the past year, notwithstanding the fact that the price of steel was somewhat higher than the year previous. The rather steady reduction in cost of cement, locally, more than offset the additional cost of structural steel—making possible the use of permanent materials in all structures with but very few exceptions.

The effect of the heavy curtailment of the appropriation for port works and bridge structures is reflected in the number of projects handled during the year. The shortage of experienced technical personnel in the Designing Division, however, has made it difficult to cope with all of the work for which funds have been available. It has been impossible for the division to make many investigations, preliminary designs and studies which should have been made in connection with future work, due to this shortage.

OFFICE

The campaign, inaugurated last year, for the improvement of the quality of concrete entering all structures built by or for the Government, was vigoriously carried on during the year with most gratifying results. Increased efficiency was noted in the system of testing building materials and a very substantial increase in strength and quality of concrete resulted; the full required strength being obtained in a large number of cases. Instructions previously issued covering methods of taking samples and making tests of various building materials were amplified and the result of each test was carefully analyzed and interpreted to the district organization. A total of 3,764 tests of cement (representing 37,640 barrels), 181 tests of concrete aggregate, and 33 miscellaneous tests of building material were made during the year. A very complete record of each test is kept on file in the central office together with instructions issued to the district office concerned, indicating the method to be followed for obtaining better results—where necessary.

Completely revised specifications, prepared by the Designing Division, governing the construction of all concrete structures for the Government were approved by the Standardization Committee, appointed to revise and unify Government concrete specification. Much of the excellent work accomplished during the past year is attributable to the rigid enforcement of the specification requirements.

An inspection of the port of Aparri was made in connection with plans for the protection of the seashore.

A considerable amount of work was also undertaken in connection with the compilation of data pertaining to wharfage fees or tolls collected at provincial ports throughout the Archipelago.

An extensive study of the business and plant of the Culion Fish, Ice, and Electric Company, Inc., was made for the purpose of evaluating the property.

A study was also made and recommendations prepared in connection with the application for a country-wide telephone franchise which was for some time under consideration.

Approximately 145 forshore lease applications were handled.

Plans, specifications, and estimates were prepared or studied and recommendations made during the year for bridge projects, port works projects, pumping and power plants, wireless stations, tanks, buildings, and their miscellaneous structure including floating equipment; such as, launches, scows, etc., listed in tabulations A, B, C, D, E-1, and E-2.

TABLE A.—*Wireless masts*

Project	Location	Type	Height	Remarks
Cagayan Radio Station	San Vicente, Cagayan	Pole	45 feet	Guyed timber.

TABLE B.—*Bridges*

Province	Road	River	Type of structure	Remarks
Albay	Albay–Sorsogon.	Putiao	Combination Howe truss.	Length, 80 ft.
Do.	do	Pili	do	Do.
Do.	do	Kumadkad	do	Do.
Do.	do	Kagbacong	do	Length, 90 ft.
Ilocos Sur	Tagudin–Vigan.	Tampogo	R. C. girders	Length, 79 ft.
Lanao	Dansalan-Lanao.	Agos	Combination Howe truss.	Length, 132 ft.
Marinduque	Gasan–Buenavista.	Matandangasan.	R. C. girders	Length, 101 ft.
Manila	City	Pasig	Subway approaches.	
Mountain Province.	Camp One–Baguio.	Bued	Steel arch	Length, 130 ft.
Nueva Ecija	Manila–North	Binituan	Steel truss and steel approach.	Length, 208 ft.
Pangasinan	San Carlos-Mangatarem.	San Juan	Steel truss and R. C. girders.	Length, 210 ft.
Do.	Pao-Lingayen	Angalacan	do	Length, 366 ft.
Rizal	Manila-Marikina	Marikina	Timber collapsible.	Length, 280 ft.
Samar	Borongan–North road.	Borongan	R. C. girders	Length, 299 ft.
Sorsogon	Gubat-Casiguran.	Sagorong	do	Length, 79 ft.

TABLE C.—*Port works*

Province	Port	Type of structure	Remarks
Cagayan	Aparri	Sea wall	Plans.
Leyte	Tacloban	Wharf	Plans and specifications.
Palawan	Puerto Princesa	Pier	Specifications.
Samar	Calbayog	Rock Jetty	Plans and specifications.
Sulu	Jolo	Pier	Do.
Manila	Manila	Pier Head No. 7	Steel roof system.
Do	do	Pier No. 5, superstructure.	Plans for sliding steel doors.
Do	do	Pier No. 5, movable platform and bridge.	Plans.

TABLE D.—*Electric installation and power plants*

Province	Location	Type	Remarks
Albay	Albay High School	Wiring	Plans and specifications.
Batangas	Batangas	Pumping plant motor	Do.
Do	Taal	do	Do.
Do	Batangas	Battery lighting plant	Do.
Do	Lemery	Electric lighting plant.	Do.
Do	Taal	Gas-electric plant 75 H. P. engine.	Do.
Do	do	Gas-electric plant 27½ K. W.	Do.
Bulacan	Malolos	Pumping plant	Do.
Capiz	Capiz	Lamp post	Do.
Cavite	Cavite	Pumping plant	Do.
Do	Indang	do	Do.
Do	Mendez-Nuñez	do	Do.
Cebu	Osmeña Fountain	Wiring	Do.
Manila	Nurses' Home	do	Plans.
Do	Jones Bridge	Light posts	Estimates.
Do	Pier No. 7, head	Wiring	Plans and specifications.
Do	Engineering Laboratory, U. P.	do	Do.
Do	Animal house, U. P	do	Do.
Do	Pier No. 7	do	Do.
Do	do	Converter plant	Specification and requisition.
Do	do	Gantry cranes	Plans and specifications.
Do	do	Overhead interior cranes.	Do.
Mountain Province.	Baguio	Hydro-electric	Do.
Do	do	Pumping plant	Specifications.
Oriental Negros	Capitol building, Dumaguete.	Wiring	Plans and specifications.
Palawan	Culion	Pumping plant	Do.

TABLE E-1.—*Investigations, reports, and recommendations*

Province	Location	Type	Remarks
Bohol	Tagbilaran	Lighting plant	Study.
Misamis	Cagayan	Pumping plant	Study and recommendations.
Mountain Province.	Baguio	Telephone, system, central board.	Recommendations.
Pangasinan	Lingayen	do	Do.
Sulu	Jolo	Lighting plant	Study, recommendation, and design.
Tarlac	Paniqui	do	Inspection and study.
Do	Tarlac Hospital	do	Inspection and recommendations.
Do	Tarlac	Pumping plant	Study and recommendations.

TABLE E-2.—*Investigations and study*

Province	Port	Type of structure	Remarks
Batangas	Batangas	Pier	Investigation and study.
Cebu	Bago	General port improvements.	Do.
Leyte	Leyte	do	Do.
Do	Ormoc	do	Do.
Romblon	Romblon	do	Do.
Sorsogon	Sorsogon	do	Do.

FIELD

A considerable amount of work was accomplished by the Designing Division during the year, in the field.

Calyx core drill outfits were kept busy throughout the year in the Provinces of Masbate, Sorsogon, Oriental Negros, Pangasinan, Tayabas, Bulacan, Manila, Cavite, Capiz, Iloilo, and Zamboanga on numerous bridge, wharf, and dock projects. The crews, which were trained during the preceding year in the handling of this type of equipment, showed marked improvement and greater efficiency in making subsoil investigations. The results obtained with these drills have enabled the division to prepare better designed structures of all classes for each location.

The old Insular Quarry site at Los Baños was abandoned and a new location further up the gorge was opened, where better rock was available and where practically no overburden was found. This move was essential as continuance at the old site would not only have been dangerous to those employed at the quarry but would have been very expensive as the great amount of overburden which would have had to be moved was out of all proportion to the rock which could be quarried below. Moreover, the quantity of high quality rock was rapidly being exhausted and it was a matter of but a few months until other sources would have had to be tapped. Costs of operation at the new quarry site will be materially decreased due to the fact that the plant is gravity operated and due to the absence of any appreciable amount of overburden. The small amount of overburden present and other debris is handled, at the new site, by means of a hydraulic sluicing gun.

Crews were trained and put in the field for operating three cement guns during the year—repairs being effected to several structures in the Province of Cebu and on the cargo sheds at Manila. A considerable number of electrical and mechanical installations were supervised, including the erection of a derrick and traveler at Pier No. 7, reconstruction and erection of five 3½-ton electric cranes at Pier No. 7, reconstruction of a floating derrick, installation of motors at Batangas, Batangas, test and acceptance of pumping plants at Cabanatuan, Nueva Ecija, Batangas, Batangas, and at Sariaya, Tayabas. In addition to this, a considerable amount of repairs to mechanical and electrical equipment was supervised.

At Manila very excellent progress was made in connection with the construction of Pier No. 7, notwithstanding the fact that the steel for the roofing system over the pier shed arrived late in March due to the delay in the release of bonds which prevented the placing of orders for this material at an earlier date. Steel sash for the windows arrived in December in a badly damaged condition, resulting in a rejection of more than 60 per cent of the order. A portion of the steel rolling doors were received in July and the remainder of this equipment will not reach Manila until March, 1924, due to the inability of the manufacturers to obtain roller bearings from other manufacturers upon whom they were dependent. Contracts made for supplying wire glass for the steel sash are greatly in arrears owing to strikes at the glass works. The Japanese disaster, with its consequent heavy demand on the manufacturers of electrical equipment of the United States, is responsible for the delay and length of time required to fill orders for electrical and mechanical equipment, such as inside overhead cranes, exterior gantry cranes, electrical transformers, and substation electrical converting machinery. The best delivery that can now be hoped for is during the month of March, 1924, for the converting machinery and interior overhead electric cranes while the exterior gantry cranes will not be received prior to June or July. Structural steel for the pier head substructure purchased early in the year from American rolling mills was discharged in Japan during the confusion which occurred after the earthquake, with the result that fabricated steel for the head works on the pier, contracted for delivery in June and July had not been delivered up to December 31.

As a result of existing world conditions which materially affected deliveries of structural materials and equipment from the United States and Belgium, it was found impractical to open the pier as previously planned, at the close of the year and unless deliveries of mechanical and electrical equipment are effected in February, it will not be possible to open the structure to traffic before April or May, 1924.

Approximately 60 per cent of the concrete superstructure has been completed and about 70 per cent of pile driving operations finished. About 85 per cent of all concrete work on both north and south wings of the pier head has been finished and approximately 45 per cent of the concrete work in the main building of the head structure has been poured. The entire structure will be completed in 1924 if the proceeds of the sale of bonds are made available.

DIVISION OF ARCHITECTURE

JUAN N. ARELLANO and TOMAS MAPUA, *Supervising Architects*

The volume of work accomplished by this Division is best indicated in the following tabulation of projects assigned to Messrs. Arellano and Mapua, respectively:

Projects assigned to Mr. Arellano showing status of each

Manila projects	Status
1. Insular Government Building	Plans are nearing completion. They will be ready for bids very shortly.
2. Post Office Building	Preparation of plans have been suspended for lack of appropriation.
3. Burnham Memorial	Plans completed.
4. Jones Bridge	Plans completed. Revisions have been made on the drawings for the bronze lamp post for bids.
5. Andres Bonifacio Monument	Work suspended for lack of appropriation.
6. Proposed Monitor on Machine Shop, Bureau of Printing.	Plans in preparations.
PROVINCIAL PROJECTS	
1. Plan of Washington Square, Daet, Camarines Norte	Pending.
2. Map of the municipality of Daet, Camarines Norte	Do.
3. Sketch plan of proposed kitchen for Pines Hotel, Baguio.	Plans completed.
4. Proposed development, Plaza Rizal, Iriga, Camarines Sur.	Plans in preparation.
5. Development plan, Provincial Building ground, Lucena, Tayabas.	Do.
6. Town plan of Candelaria, Tayabas	Pending.
7. Proposed changes in Cottages A and B, Baguio	Plans completed.
8. Rizal Monument, Ibahay, Capiz	Do.
9. Batangas Provincial Building	Plans in preparation.
10. Zambales Provincial Building	Preliminary plans completed.
11. General Malvar Memorial School, Batangas	Plans completed.
12. Baguio School	Do.
13. Rizal Monument, Sorsogon, Sorsogon	Revision completed.
14. Proposed Plaza Trece Mártires Monument, Naga, Camarines Sur.	Plans completed.
15. Anthrax laboratory	Preliminary plans completed.
16. Cabatuan Municipal Building, Iloilo	Plans in preparation.
17. Hanly Memorial, Zamboanga	Under study.
18. Del Pilar High School, Bulacan	Plans completed.

Projects assigned to Mr. Tomas Mapua showing status of each

Manila projects	Status
1. San Lazaro Hospital	Drawings for the improvement of grounds were prepared and completed.
2. Pier No. 7	Elevation of passenger passageway and ceiling were revised.
3. Pier head	Full size details.
4. Animal house, College of Medicine	Preliminary plans and complete set of working drawings were prepared.
5. Ayuntamiento Building	A design for a suitable "media agua" was submitted.
6. Normal School	Drawings for "media agua" were prepared.
7. Chemical Laboratory, University of the Philippines	Drawings for temporary lecture stand were prepared.
8. Executive Building	Drawings for grill doors were prepared.
PROVINCIAL PROJECTS	
1. Standard Provincial Hospital	Preliminary plans and working drawings for two stages completed.
2. Bureau of Education Standard Plan No. 10.	Working drawings were revised and completed.
3. Poro Presidencia, Cebu	Preliminary plans submitted.
4. Nurses Dormitory, Zamboanga General Hospital	Preliminary plans were approved and the drawings are nearing completion.
5. Clarin Presidencia, Bohol	Working drawings and location prepared.
6. Capiz High School, Capiz	Working drawings for concrete steps were prepared, and several preliminary plans for the memorial arch were submitted.
7. Baao, Presidencia, Camarines Sur	Full size details.
8. Mati Hospital, Davao	Preliminary plans submitted.
9. Culion Steam Laundry, Culion	Complete working drawings.
10. Daet Provincial Building, Camarines Norte	Preliminary plans submitted.

Projects assigned to Mr. Tomas Mapua showing status of each—Continued

Manila projects	Status
11. Ibaan Presidencia, Batangas	Preliminary plans submitted.
12. Laoag Provincial Building, Ilocos Norte	A design for a suitable "media agua" was prepared.
13. Rest House, Baguio	Preliminary plans were approved and working drawings are being prepared.
14. Enclosure of Grand Stand, Baguio	A sketch was prepared.
15. Burnham Lake, Baguio	Lighting arrangement submitted.
16. Dumaguete Provincial Building, Oriental Negros	Complete working drawings were prepared. Full size details are nearing completion.
17. Jose Rizal Memorial Hall, Baguio	Preliminary plans submitted.
18. San Luis Presidencia, Batangas	Location plan was prepared.
19. Cainta Presidencia, Rizal	Do.
20. Orion Memorial School, Bataan	Do.
21. Ramos Presidencia, Tarlac	Do.
22. Mati Emergency Hospital, Davao	Do.
23. Albay Hign School, Albay	Do.
24. Naguilian Presidencia, La Union	Do.
25. Rosales Presidencia, Pangasinan	Do.
26. Bacolod Hospital, Occidental Negros	Do.
27. Alaminos Presidencia, Pangasinan	Do.
28. M. H. del Pilar Memorial School, Bulacan	Do.
29. Dagupan Hospital, Pangasinan	Do.
30. Lucena Hospital, Tayabas	Do.
31. Santa Cruz Hospital, Laguna	Do.
32. Santa Ana School, Pampanga	Do.
33. Baganga Emergency Hospital, Davao	Do.

During the greater portion of the calendar year, the Division of Architecture has had most of its personnel at work on the completion of the drawings of the Legislative (Insular) Building. The completion of the drawings for standard provincial hospitals was accomplished, in so far as relating to permanent concrete buildings, and drawings for the same type will be undertaken for semi-permanent buildings. Special problems presented themselves for municipal buildings, domestic science buildings, and schools.

The foundations for the future Post Office on Plaza Lawton having been completed several years ago, it is hoped that work on the drawings for this building can be resumed, so that when funds can be made available, no time will be lost due to the noncompletion of the drawings and specifications. With the limited personnel of the Division of Architecture and judging by past experience, it does not seem probable that much can be done toward the completion of the above drawings, unless the personnel is augmented. The foundations for the future Customhouse on the Port Area, were also completed several years ago. The working drawings for this project, though nearly completed at that time, were suspended, due to nonappropriation. It is desirable that these drawings be completed for the same reasons as above stated.

Limited assistance has been given the Bureau of Education, not as much however as it deserves or as much as this Division would like. Bills of materials for standard schools are desirable and have been requested, but other work prevents their completion.

IRRIGATION DIVISION

A. D. WILLIAMS, *Chief Irrigation Engineer*

INSULAR IRRIGATION PROJECTS

Construction work during 1923 was confined largely to projects approved for construction during previous years. Substantial progress was made on all projects under way and the Baruyen River, Naic and Aganao River projects were completed. The combined cost of these projects was approximately ₱1,280,000 and they serve a total area of 7,000 hectares.

Three new projects, the Sibalom–San Jose project in Antique Province, the San Miguel Extension project in Tarlac Province, and the Peñaranda River project in Nueva Ecija and Bulacan Provinces, were approved for construction during the year under the provisions of Act 2152 as amended. Construction work was started on the Sibalom–San Jose project just before the end of the year, while work on the San Miguel Extension and the Peñaranda River projects is pending the release of funds.

Funds were provided totaling ₱2,000,000 on October 17, 1923, for the different projects under construction, from the sale of bonds authorized by Act 3013, making the total of funds released thus far from this source, ₱5,440,000, while funds provided during previous years from current revenues of the Government amount to ₱2,942,000. The status of all insular projects which have been financed from these funds, or approved for construction since the reorganization of the Division in 1918 is given in the following table:

Project	Province	Irrigable area	Estimated cost	Allotments authorized	Total expenditures and liabilities	Percentage of work completed
		Hectares				
Trinidad	Mountain Province	200.0	₱40,000	₱40,000	₱40,000	Completed (1921).
Santa Barbara	Iloilo	4,945.6	692,000	692,000	692,000	Completed (1922).
Dingras	Ilocos Norte	1,009.5	130,000	130,000	130,000	Completed (1922).
Baruyen River	do	810.7	89,000	89,000	89,000	Completed (1923).
Naic	Cavite	676.0	300,000	292,000	292,000	Do.
Aganao River	Iloilo	5,500.0	917,000	917,000	908,335	Do.
Talavera River	Nueva Ecija	8,000.0	1,050,000	1,028,000	1,020,026	90 per cent completed.
Tagudin River	Ilocos Sur	1,500.0	350,000	325,000	314,869	70 per cent completed.
Amburayan River	La Union	4,500.0	950,000	844,000	824,566	65 per cent completed.
Angat River	Bulacan	25,000.0	4,500,000	3,250,000	3,000,830	52 per cent completed.
Lamao	Bataan	160.0	30,000	5,000	3,424	2 per cent completed.
Laoag–Vintar	Ilocos Norte	6,000.0	1,000,000	700,000	690,229	20 per cent completed.
Dipolog	Zamboanga	1,000.0	110,000	97,500	54,076	50 per cent completed.
Sibalom–San Jose	Antique	4,000.0	500,000	300,000	140,175	2 per cent completed.
San Miguel Extension	Tarlac	4,500.0	380,000			No funds.
Peñaranda River	Nueva Ecija and Bulacan	18,000.0	2,250,000			Do.
Totals		85,801.8	13,288,000	8,709,500	8,199,530	

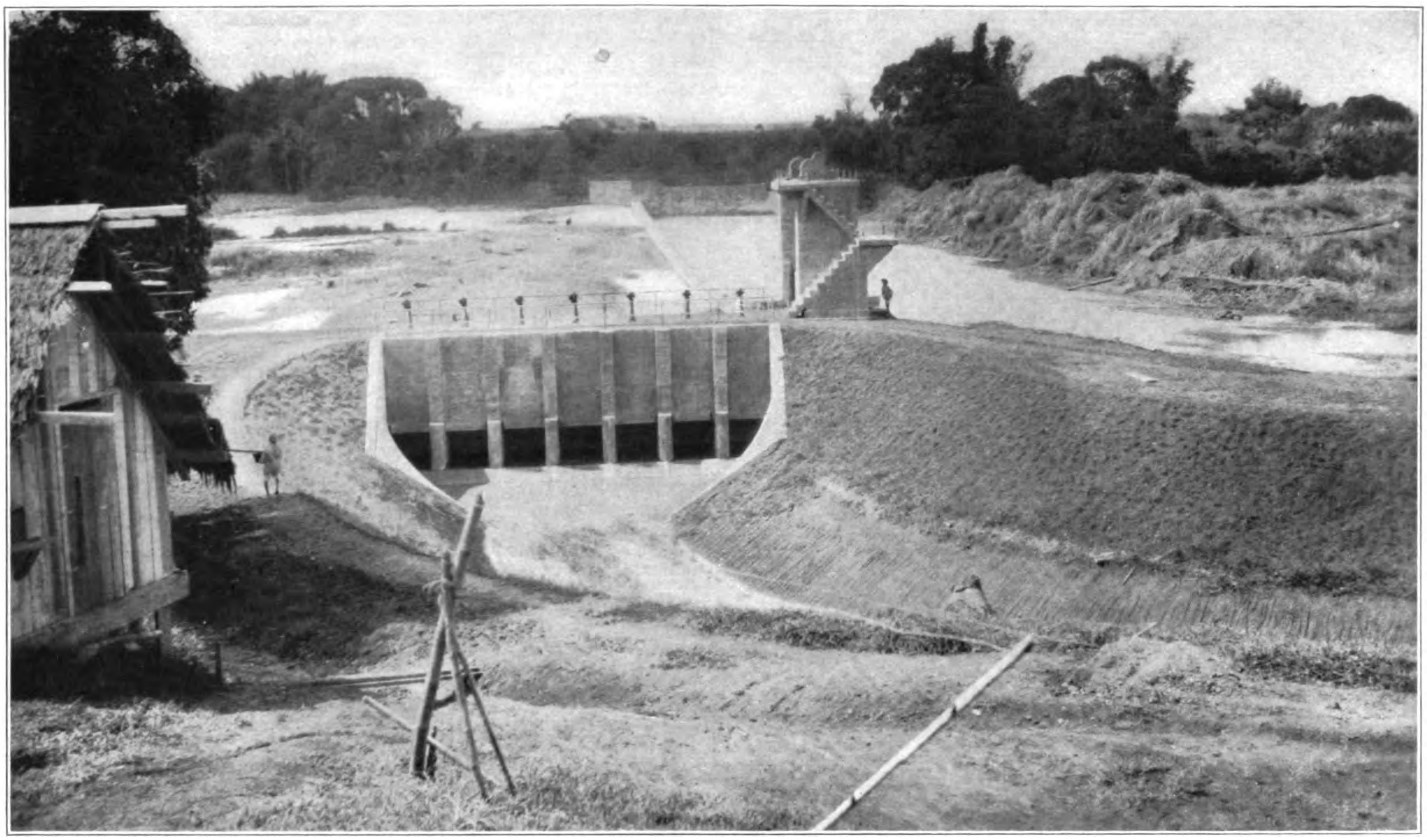
Trinidad Irrigation Project.—This project was constructed primarily to irrigate land in the Trinidad Farm School and was turned over to the Superintendent of the School for operation and maintenance upon completion in 1921.

Santa Barbara Irrigation Project.—This project was completed and officially opened in 1922. A description of the project may be found in previous annual reports of the Division. A good crop of palay was produced under the system in 1923; several farmers having reported a yield of 100 cavans per hectare.

Dingras Irrigation Project.—Construction work was completed by administration on this project in 1922 and the system officially opened on January 1, 1923. A continuous supply of water has been available for the landowners and as excellent crop of rice was produced during 1923.

Baruyen River Irrigation Project.—Construction work on this project was completed and the system officially opened on July 15, 1923. All work was done by administration at a total cost of ₱89,000, making the annual installment charge for the 810.69 hectares of irrigable land ₱5.55. A large part of the land under this system was cultivated for the first time in 1923, since irrigation water was considered essential to growing rice due to the class of subsoil. A good yield of palay was obtained from the land planted to this crop.

Naic Irrigation Project.—Construction work on this project, which was taken over by administration from the Manila Engineering Co., (the contractors for the dam and canal excavation work) in May, 1922, was completed and the system officially opened on July 1, 1923. The cost of construction exceeded the original estimate of ₱275,000 by ₱17,000, making the final cost, ₱292,000. The system as com-



Aganao Irrigation System, main dam and head works

pleted irrigates 676 hectares of land in the Naic Friar Estates and can be extended to serve some 100 hectares of additional land. The system was turned over to the Director of Lands for operation and maintenance effective July 1, 1923.

Aganao River Irrigation Project.—Construction work on this project was practically completed at the end of the year and the system can be officially opened at an early date, or as soon as the cadastral survey of a portion of the irrigable land not covered by the Bureau of Lands' previous survey is completed. All work was accomplished by contract at prices well within estimates; the contractors being the Atlantic Gulf and Pacific Company for the diversion works, the Manila Engineering Company for the canal excavation work and Messrs. Robinson and Hanson for all canal structures. The system will irrigate approximately 5,500 hectares, two-thirds of which was furnished water for the 1923 rice crop.

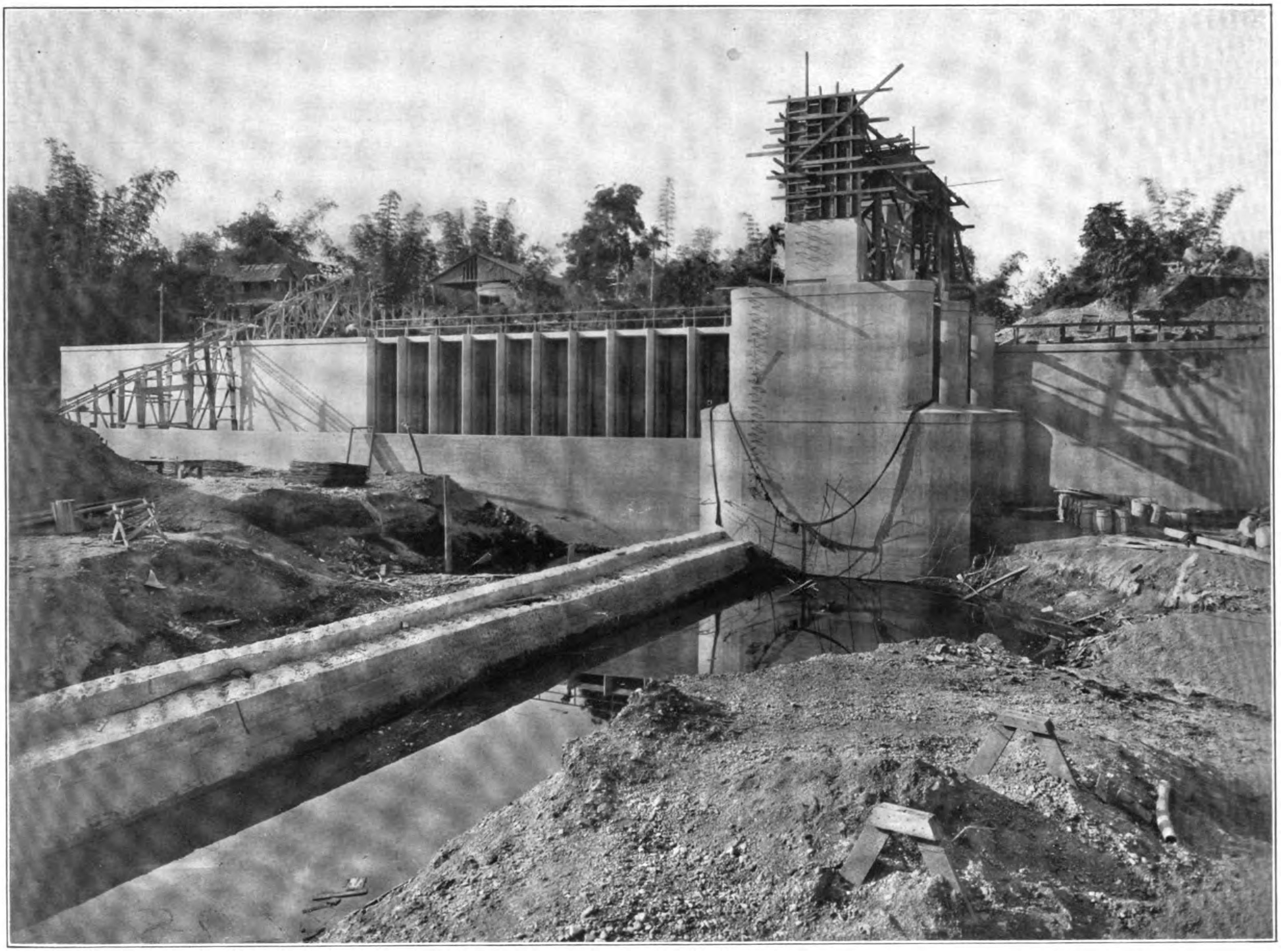
Talavera River Irrigation Project.—This project would have been completed during 1923 but for the failure of the contractor, Mr. A. R. Eichler to construct the lateral canal structures in accordance with the terms of his contract, Mr. Eichler's contract was annulled under date of July 21, 1923, on account of abandonment of the work which he stated was due to his financial difficulties. A new contract was entered into under date of October 18, 1923 with Messrs. Agcaoili and De la Cantera, two of Mr. Eichler's bonsmen, for the completion of the work left by Mr. Eichler. This contract provides that the work must be completed by June 30, 1924, which means that the whole system should be placed in operation in time for the next rice growing season. The completed portion of the system, which commands an area of 2,056.7 hectares including the land formerly served by the old Tulat system, was officially opened on November 15, 1923, but water was actually furnished from July first for about 5,000 hectares of land. An excellent rice crop was grown on this land, while a very short crop was produced on unirrigated land, due to the lack of rain during the month of October. In fact, this was the case throughout the Central Luzon Valley and in Northern Luzon, the principal rice-producing sections.

Tagudin Irrigation Project.—The excavation of the 1,320-lineal-meter diversion tunnel was completed during the early part of December, 650 meters having been driven by administration during 1923. As stated in previous reports, the unstable formation and water encountered were responsible for the slow progress and the cost of the work exceeding the Division's estimates. Lining has been placed in sections totaling 255 lineal meters and it will be necessary to line at least 300 additional meters and possibly the whole tunnel, depending upon the effect the air has upon the soft rock formation. This work is being done by administration due to the high prices bid by contractors. The remaining work to complete the project, including the excavation of the canal system and the construction of canal structures is under contract with Mr. F. T. Ryan and must be completed in July, 1924. This system should therefore be ready to deliver water for the next rice crop.

Amburayan River Irrigation Project.—The excavation of the 750-meter tunnel by administration was completed in May, 360 meters having been driven during 1923. Aside from this, construction work on this project was confined to the excavation and lining of the main canal where it is heavy cut ranging from 5 to 9 meters deep. This work is being accomplished by the "paquiao" system, this method having proven cheaper than by using a drag line excavator which was available.

Contracts have been recently awarded to Contractor Ryan for excavating the remaining portion of the main canal, lateral and drainage canals and for building all canal structures. The contracts provide that this work must be completed by December 12, 1924, but it is expected that a portion of the system will be ready to deliver water for the next rice crop.

Angat River Irrigation Project.—The excavation of the south side canal system was completed by the contractor, the Atlantic Gulf and



Angat dam and sluiceway piers under construction. South headworks in background

Pacific Company, on December 12, 1923, an extension of time having been authorized from March 1 to December 31, 1923, due to the late rainy season of 1922 and the exceptionally large amount of rainfall during the early part of 1923. This work involved the necessary clearing and the excavation of 750,087 cubic meters of earth, 22,556 cubic meters of rocks, 198,072 cubic meters of borrowed material, and 53 lineal meters of tunnel.

The unseasonable rains during the usual dry season also prevented Contractor Findley from completing the diversion works in the Angat River on contract time (August 14, 1923) and he has been granted an extension of time for this work to June 30, 1924. In recommending this extension the project engineer stated that "river conditions made it impracticable for the contractor to work on the dam proper for more than about six weeks during the usual dry season." The contractor has completed the head works and sluices at each end of the weir but has only completed about 80 meters of the weir, which is 502 meters long. The work remaining to be done consists of considerable wet excavation and placing of about 17,500 cubic meters of concrete.

A contract was awarded to Mr. Romarico Agcaoili during the month of December for constructing all canal structures required for the south side system, the starting of this work having been delayed pending the release of additional funds for the project. The contract provides that the work shall be finished on November 15, which should permit the opening of the south side system about July 1, 1925. However, with the completion of the diversion works on or before July 1, 1925, it should be possible to furnish water for a considerable portion of the land under the south side system for the next rice crop.

Bids have been requested and will be opened on January 12, 1925, for the excavation of the north side canal system, which will serve an area of approximately 10,000 hectares; there being about 15,000 hectores under the south side system. If the additional funds required for the north side canal structures can be provided during 1925, it is planned to complete the project as a whole by July 1, 1925.

Lamao Experiment Station Irrigation Project.—Construction work was discontinued in August, 1921, and ₱25,000 of the ₱30,000 appropriation reverted by the Emergency Board to the Insular Treasury. The completion of this project, which is a special project for the Bureau of Agriculture, is pending the release of funds.

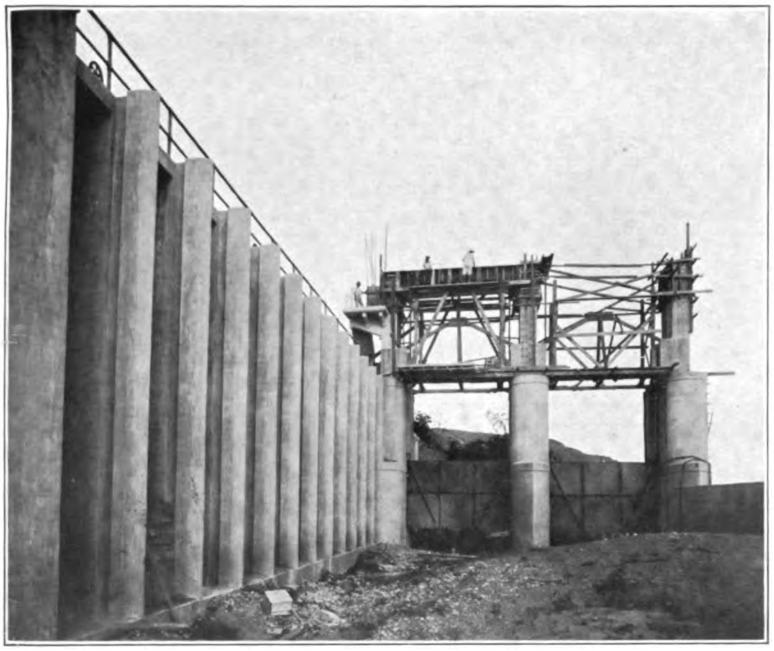
Laoag-Vintar Irrigation Project.—Fairly satisfactory progress was made by the contractor, Mr. Sotero Baluyot, on the excavation of the canal system during the dry season of 1923. This work is to be completed by June 1, 1924. With the release of an additional allotment of ₱400,000 for the project, bids were requested and contract awarded to Messrs. Gordon & Haley for the construction of the diversion works and main canal structures. The contract provides that this work shall be completed by March 20, 1925, and if the additional funds required for lateral canal structures can be provided during the present dry season, the system should be ready to deliver water for the 1925 rice crop.

Dipolog Irrigation Project.—The construction of this project was started in 1920 as a municipal project, under the provisions of Act 2755, but the municipality of Dipolog was unable to finance its completion and construction work was discontinued by the District Engineer of Zamboanga in June, 1921. The completion of the proposed system as an Insular project was approved by the Honorable, the Secretary of Commerce and Communications in December, 1922, but a protest filed by a number of the interested landowners against the payment of the estimated annual installments, based on the total cost of the project, served to delay the resumption of construction work during 1923. This protest was finally withdrawn upon the amendment of the conditions of the irrigation notice so as to require the landowners to pay annual installments based on the cost of completing the work and resumption of work was authorized on December 4, 1923. Construction was reported about 50 per cent completed upon discontinuing same in 1921 and it is believed that the project can be completed during the dry season of 1924.

Sibalom–San Jose Irrigation Project.—The construction of this project was approved by the Honorable, the Secretary of Commerce and Communications on May 24, 1923, and construction work authorized with the release of funds in October. A contract was awarded to Mr. A. G. Yankey, of Iloilo, for the excavation of the canal system on November 7, 1923, and bids will be requested for the construction of canal structures early in 1924. It is planned to complete this system during the dry season of 1924.

San Miguel Extension Project.—This project contemplates the extension of the San Miguel irrigation system in Tarlac Province to serve an additional area of approximately 4,500 hectares. The irrigation notice required by section 25 of the Irrigation Act was published in March, 1923, and since no protest was received from the interested landowners within the 90 days period fixed by law, construction work has been pending the release of funds. This project can be completed during 1924, if funds are provided during the early part of the dry season.

Peñaranda River Irrigation Project.—This project was also approved for construction in March, 1923, and the required irrigation notice duly published. No protests were received from the landowners and construction work has therefore been pending the release of funds since June, 1923. It is proposed to undertake the excavation of the canal system and the construction of the diversion works in 1924 if sufficient funds are provided and to complete the project in about two years.



South sluice gates and operating platform, Angat diversion works, Bulacan Province

OPERATION AND MAINTENANCE

All completed Insular irrigation systems, with the exception of the Trinidad system in Benguet Province and the Naic system on the Naic Friar Estate, Cavite Province, are operated and maintained by the Division in accordance with the regulations approved by the Honorable, the Secretary of Commerce and Communications in October, 1921. The following table gives the irrigable area, annual installments to cover the cost of construction with interest, cost of operation and maintenance during 1923, total charges per hectare to be paid by landowner in 1923, and other pertinent information regarding each system:

System	Province	Cost of construction	Irrigable area	Annual installment per hectare	Cost of operation and maintenance 1923	Total charges per hectare 1923	Construction work completed
			Hectares				
Pilar	Bataan	₱27,606.70	174.00	₱8.65	₱968.95	14.50	1912
San Miguel	Tarlac	1,089,000.00	4,000.00		17,916.45	6.00	1913
Trinidad	Benguet	40,000.00	200.00		([a])		1921
Santa Barbara	Iloilo	692,000.00	4,945.56	7.01	10,639.98	9.34	1922
Dingras	Ilocos Norte	130,000.00	1,009.47	6.50	3,341.43	10.00	1922
Burayen River	....do	89,000.00	810.69	5.55	825.31	6.70	1923
Naic	Cavite	292,000.00	675.97	21.82	([b])		1923
Talavera River	Nueva Ecija	1,050,000.00	2,056.73	[d]2.50	2,870.75	[d]2.50	1923
Do	....do		([c])	6.02		9.45	

[a] System operated and maintained by the Superintendent, Trinidad Farm School.
[b] System operated and maintained by the Bureau of Lands.
[c] Area under completed portion of system.
[d] Charge of ₱2.50 is for 1,171.53 hectares of land formerly served by an old irrigation system from the Talavera River.

The San Miguel irrigation system was constructed and is being operated and maintained in accordance with the terms of special contracts with the Compañía General de Tabacos de Filipinas, the owner of all the land under the present system. The annual charges are: ₱1 per hectare of irrigable land and ₱5 per hectare for the land actually irrigated; the cost of operation and maintenance being borne by the Government.

Provincial and Municipal Irrigation Projects.—The Division recommended in June, 1923, extension and improvement of an old irrigation system in the municipality of Santa Lucia, Ilocos Sur, to irrigate 1,900 hectares of land in the municipalities of Santa Lucia and Candon as a provincial project under the provisions of Act 2753. The estimated cost of the work is ₱133,000. Preliminary plans have been prepared and construction work may be undertaken as soon as the Province of Ilocos Sur has financed the project. This is the first provincial project recommended since the passage of Act 2753.

The Division also recommended the improvement and extension of an existing irrigation system in the municipality of Candon, Ilocos Sur, to irrigate an area of approximately 1,000 hectares as a municipal project under the provisions of Act 2755. The estimated cost of the work is ₱78,000 and it is believed that the municipality of Candon will be able to finance its share of the cost of the sale of bonds. Plans have been prepared.

The following is a complete list of municipal irrigation projects recommended for construction since the passage of Act 2755:

Project	Province	Irrigable area	Estimated cost	Appropriations		Remarks
				Insular	Municipal	
		Hectares				
Santa Maria	Zamboanga	431	₱23,000	₱16,000	₱7,000	Completed 1920.
Ayala	do.	183	17,000	11,500	5,500	Completed 1922.
Pililla	Rizal	180	20,000			Construction recommended in 1919.
Morong	do.	580	30,000			Do.
Bulacan	La Union	1,400	80,000			Do.
San Fabian	Pangasinan	4,000	60,000			Do.
Mangatarem	do.	2,000	45,000			Do.
Candon	Ilocos Sur	1,000	78,000			Construction recommended in 1923.
Total		9,774				

All projects pending as indicated above contemplate the improvement and extension of existing system. Preliminary plans have been prepared and construction work may be undertaken whenever the municipalities concerned are able to finance same.

IRRIGATION PROJECTS UNDER CONSIDERATION

The following list gives the location, irrigable area, and status of important irrigation projects under consideration:

Province	Project	Irrigable area	Status
		Hectares	
Albay	Quinali–Lake Bato	6,000	Awaiting investigation.
Do.	Malinao–Tabaco	600	Do.
Camarines Norte	Daet	2,000	Topographic survey completed.
Do	Talisay–Indan	3,000	Do.
Camarines Sur	San Jose–Hagonoy	5,000	Awaiting investigation.
Do.	Pauili Valley	5,000	Topographic survey completed.
Do	Barit River	2,000	Awaiting investigation.
Bataan	Dinalupijan	2,500	Do.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
Do.	Mambusao	1,000	Preliminary investigation, 1911.
Do.	Macato–Malinao	1,200	Do.
Do.	Ibahay	500	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Investigation in progress.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
Do	Candon	1,000	Recommended for construction, Act 2755.
Do.	Santa Cruz	1,000	Preliminary survey completed.
Casupitan River	Santa Lucia and Candon	1,900	Recommended for construction, Act 2753.
Batangas	Batangas	1,000	Investigation in progress.
Do.	Balayan	300	Do.
Do.	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Topographic survey completed.
Do.	Pototan	2,300	Survey and preliminary design made.
Do.	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Topographic survey completed.
La Union	Balaoan	1,200	Survey and plans completed.
Do.	Bacnotan	2,000	Topographic survey completed.
Do.	Agoo–Tubao	2,000	Awaiting investigation.
Do.	Naguilian	1,000	Preliminary survey completed.
Do	Rosario	1,000	Topographic survey completed.
Do.	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	1,000	Topographic survey completed.
Do.	Palo	1,000	Preliminary investigation in progress.
Do.	Dagami–Tanauan	14,000	Awaiting investigation.
Do.	Dato–Hilongos	3,500	Do.
Nueva Ecija	Pampanga River	25,000	Topographic survey completed.
Nueva Vizcaya	Murong	1,200	Do.
Occidental Negros	Binalbagan–Himamaylan	3,000	Do.
Do.	Bago	20,000	Do.
Do.	Silay project	5,000	Awaiting investigation.
Oriental Negros	La Granja Extension Station	200	Investigation in progress.
Do.	Tanjay	800	Awaiting investigation.
Do.	Tolong	3,000	Preliminary investigation made.
Pampanga	Porac	1,000	Topographic survey completed.
Do.	Bamban	3,000	Do.
Do.	Gumain	5,000	Do.
Pangasinan	Agno	40,000	Topographic survey in progress.
Do.	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do.	San Fabian	4,000	Do.
Do.	Manila River	5,000	Topographic survey in progress.
Rizal	Mariquina Valley	5,000	Topographic survey completed.
Do.	Pililla	180	Recommended for construction, Act 2755.
Do.	Morong	580	Do.
Tarlac	Capas	5,000	Topographic survey completed.
Do.	Tarlac	25,000	Topographic survey in progress.
Zambales	San Marcelino	4,000	Topographic survey completed.
Do.	Toton–Lanom	600	Preliminary survey completed.
Do	Iba	400	Do.
Total		299,130	

Topographic surveys were completed during 1923 of the Pampanga River irrigation project in Nueva Ecija and the south side Bago River project in Occidental Negros, covering a total area of over 40,000 hectares. Survey work was also practically completed for the Agno River project in Pangasinan, which embraces an area of over 40,000 hectares. This makes 28 projects, in addition to those under way, which have been surveyed and are ready for construction as soon as funds can be made available. These projects would irrigate a total area of about 150,000 hectares, while projects under or awaiting investigation would benefit an additional estimated area of 150,000 hectares. Investigations were in progress at the end of the year, with survey parties in the field, on the Agno and Banila Rivers projects, Pangasinan; San Nicolas project, Ilocos Norte; and Tarlac River project, Tarlac.

PROGRAM FOR THE CONSTRUCTION OF INSULAR IRRIGITION PROJECTS

In addition to the irrigation projects approved and under construction the following projects have been tentatively included in the program for the construction of irrigation projects from the 20,000,000-peso bond issue authorized by Act 3013.

Project	Province	Irrigable area	Estimated cost	Remarks
		Hectares		
Murong	Nueva Vizcaya	1,500	₱130,000	
Santo Tomas River	Zambales	4,000	450,000	Construction recommended 1924.
Barugo	Leyte	1,000	200,000	Do.
Agno River	Pangasinan	30,000	5,000,000	Do.
Pampanga River	Nueva Ecija	25,000	3,000,000	
Pañgiplan River	Occidental Negros	3,000	400,000	
Bacnotan	La Union	2,000	200,000	
Santa Cruz River	Laguna	5,000	650,000	
Daet–Talisay	Camarines Norte	4,000	500,000	
Total		75,500	10,530,000	

HYDROGRAPHIC INVESTIGATIONS

Stream measurements were made by hydrographers of the Division during 1923 at 143 permanent and 70 temporary stations. Daily gage-height readings were made at all permanent stations by gagekeepers employed by the Division, and records also kept of 20 rain gages established in localities where records are not kept by the Weather Bureau. A total of 13 permanent gaging stations were discontinued during the year and 7 new stations established, leaving 130 permanent stations to be maintained at the end of the year.

The hydrographic data collected during the years 1908 to 1922, inclusive, is being printed in bulletin form and will be ready for distribution to the public at an early date.

The funds expended on hydrographic investigations during 1923 will amount to approximately ₱60,000.

WATER RIGHTS

There were received during the year a total of 132 new applications for water rights, 122 of which were for irrigation and 10 for power development purposes. A total of 208 applications were finally acted upon, 141 of which were granted and 67 disapproved by the Secretary of Commerce and Communications, upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 6,324.8 hectares of land. There are 37 applications pending action by the Irrigation Council.

There were 24 applications for power development approved for developing a maximum of 14,295 horse power. Three of the approved applications for power purposes were filed during the year 1923 and the rest in 1922.

Complete determination of old water rights was made on two streams during the year, making the total number of streams so adjudicated, to date, 22. The adjudications completed during 1923 involve 6,843 separate rights or parcels of land and affect the title to water for irrigating 10,231.7 hectares of land. There were two streams designated for adjudication during the year 1923.

Surveys have been completed and maps prepared showing all water right locations on two river systems. These surveys included 15,200 hectares of irrigated lands. The streams which have been so surveyed and are now pending adjudication are given in the following table:

Stream	Province	Number of diversion ditches	Length of main canal in meters	Number of municipalities affected	Approximate number of hectares irrigated
O'Donnell-Moriones and Tarlac Rivers	Tarlac	2	4,000	4	10,000
Ango and Gogo Rivers	Pampanga	25	970	4	5,200
Total					15,200

Surveys are in progress with surveying parties in the field on the following streams:

Stream	Province	Municipalities affected	Approximate area of land irrigated in hectares
Banila River	Pangasinan	Rosales, Balungao, Umingan, and Santa Maria.	2,000
Andulas or Burubor River.	....do	Balungao and Rosales	1,000
Bued or Naotayangas River.	Nueva Ecija and Pangasinan.	Cuyapo and Rosales	1,500
Parasapas Creek	Pangasinan	Tayug and Natividad	300
Porac River	Pampanga	Lubao, Floridablanca, Porac, and Guagua.	3,200
Gumain River	....do	....do	1,200
Caulaman River	Pampanga and Bataan.	Lubao, Dinalupihan, and Hermosa.	300
Total			9,500

The streams which have been designated for adjudication and on which no work has been accomplished are given below:

Stream	Province	Municipalities affected	Approximate area of land irrigated in hectares
Masisi River	Albay	Ligao and Oas	1,000
Yaarihan	Camarines Norte	Naga, Magarao, and Calabanga	1,200
Maoguingoguing River.	Ilocos Norte	Vintar	500
Lubnac	....do	Sarrat	300
Bursay River	....do	Solsona and Dingras	1,500
Nagdesaagno River	....do	Piddig	800
Paoay Lake	....do	Paoay and Batac	500
Banglayan River	Ilocos Sur	Narvacan	2,000
Codoog or Barabogobong River.	....do	Narvacan and Nagbukel	1,000
Matictic Greek	Nueva Ecija	Bongabon	400
Malabago or Anondacan River.	Pangasinan	Malasiqui, San Carlos, Calasiao, and Santa Barbara.	1,000
Maolo River	....do	Sison and Pozorrubio	2,500
Gogo and Buge Esteros.	Tarlac	Concepcion	1,000
Pias Estero	....do	Moncada and San Manuel	500
Canpuolo River	Tayabas	Candelaria	500
Padsan River	Ilocos Norte	Banua	1,900
Bagubuuban Estero	....do	Badoc	300
Total			6,900

RIVER CONTROL PROJECTS

The Division prepared plans and estimates for 12 new river control projects and for improving 5 river control works constructed during previous years. Investigations and studies were also made of 16 others as shown in the following table of active projects:

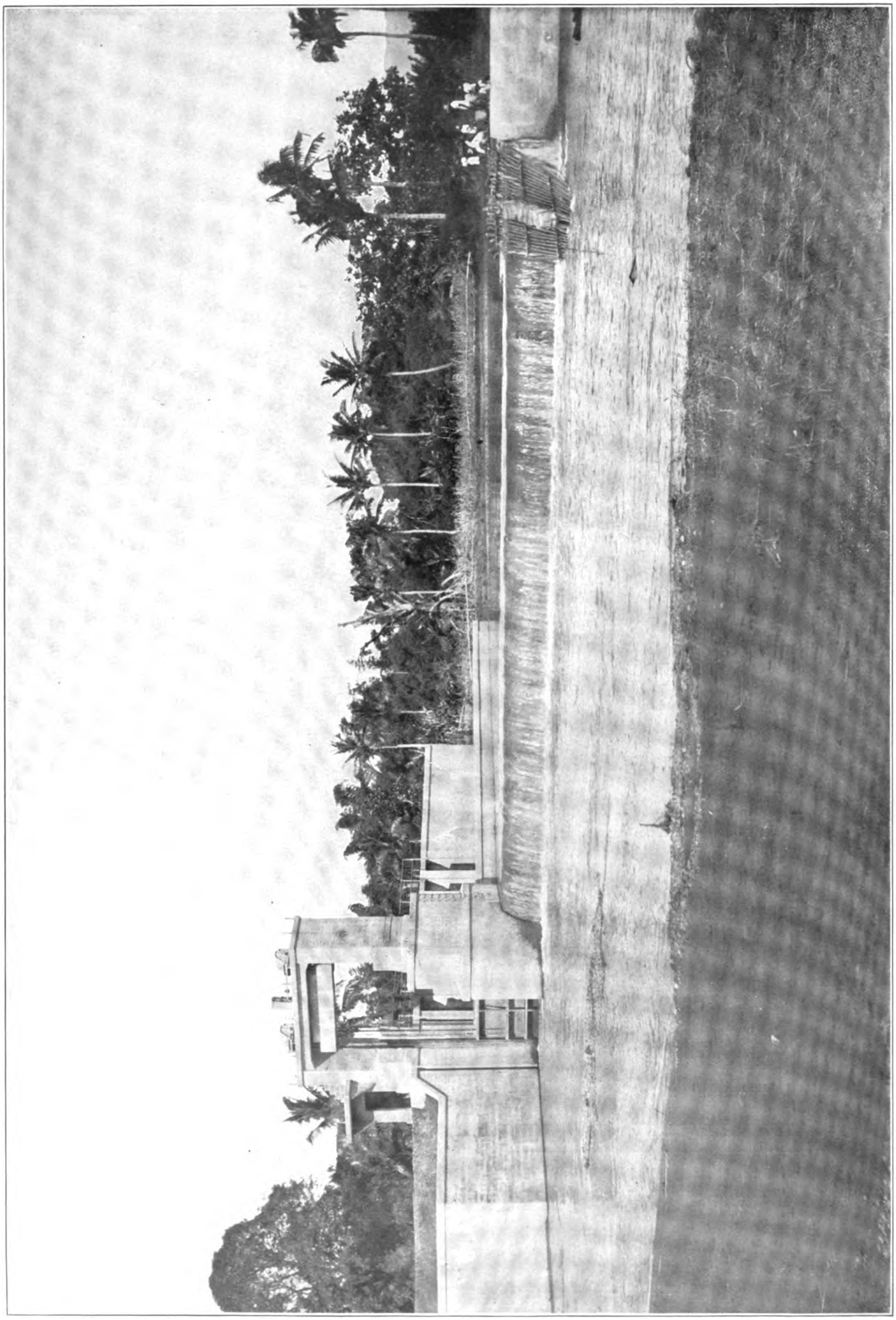
Province	Municipality	River	Type of work	Estimated cost or funds available	Status
Antique	Barbaza	Binangbang	Channel diversion		Under investigation.
Do	Culasi	Bacong	....do		Do.
Batangas	Balayan	Binambang	Earth dyke	₱27,000.00	Under construction by contract—Allotment of ₱16,000 made.
Do	Batangas	Calumpang	Repair and protection of existing spur dykes.	7,500.00	Partially completed with an allotment of ₱5,000.00.
Cagayan	Lal-lo	Cagayan	Bank revetment	30,000.00	Preliminary estimate made.
Capiz	Calivo	Aclan, and Sooc Creek	Bank revetment, earth dyke, and permeable dams.	50,000.00	Revetment and permeable dams completed. Allotment of ₱50,000 made in 1922.
Cebu	Barili	Mastayupan	Earth levees and construction of drainage channel.	15,000.00	Preliminary plans prepared. Not financed.
Do	Carcar	Carcar	Earth levees and channel straightening	40,000.00	Plans prepared. Not financed.
Iloilo	Igbaras	Igbaras	Bank revetment	25,000.00	Plans prepared. Allotment withdrawn.
Do	Cabatuan	Cabatuan	....do	8,000.00	
Do	Dumangas		Channel improvement		Report only.
Ilocos Norte	Paoay	Gabur	Earth levees		Do.
Do	Vintar	Vintar	Channel diversion and bank protections		Under investigation.
Ilocos Sur	Vigan	Govantes	Earth dam to close river channel	100,000.00	Do.
Do	....do	Mestizo	Bank revetment		
La Union	Luna	Maluyo	Channel diversion		
Do	Santo Tomas	Santo Tomas	....do		
Leyte	Alang-alang	Mainit or Cabayungan	Channel improvement and bank protection		Under construction with road funds.
Do	Dagami	Binahaan	Bank protection and improvement of out-off channel.		Under investigation.
Do	Hinunangan	Hinunangan	Earth dyke and bank protection		Do.
Do	Ormoc	Acilao	Bank protection	25,000.00	Under construction.
Do	....do	Malbasag	Channel improvement and protection of Perdon Bridge.		Under construction with funds from preceding project.
Do	Barugo	Minusuang	Channel improvement and protection of bridges.		Under investigation.
Marinduque	Boac	Boac	Extension of completed bank revetment	2,000.00	Previous allotment, ₱23,000.
Oriental Negros	Tanjay	Tanjay	Existing spur dykes		Under investigation.
Pampanga	Santa Rita, Betis, Bacolor, and Guagua.	Potrero or Pasig and Gumain.			Do.
Do	Arayat, San Luis, San Simon, and Apalit.	Pampanga	Repairs to Arnedo dyke	30,000.00	Under construction.
Do	Arayat	....do	Cut-off channel		Do.
Pangasinan	Bayambang	Agno	Earth dyke and cut-off channel	50,000.00	Do.
Do	Asingan	Agao	Earth dyke	50,000.00	Do.
Do	Rosales	Banila	Channel diversion		Under investigation.
Samar	Catarman	Catarman	Repairs to existing spur dykes	12,000.00	Under construction.
Tarlac	Tarlac	Tarlac	Construction of permanent spur dyke	5,000.00	Under construction to protect downstream end of concrete paving.
Do	San Miguel	O'Donnell	Protection of levees		Under construction.
Tayabas	Sariaya	Lagnas and Sariaya	Channel diversion and improvement		Under investigation.

Construction work was carried out by District Engineers on all projects except on the O'Donnell River dyke, which was under the direct supervision of the Division.

The Division also compiled considerable data on river control projects and otherwise assisted the Central Luzon River Control Commission in the preparation of its report and in drafting proposed legislation, to "regulate the construction and maintenance of drainage systems, dykes, and river control works and to provide a method for financing same," which were submitted to his Excellency, the Governor-General in October, 1923.

WATERWORKS

The Division prepared plans and specifications for 11 municipal waterworks projects on which construction work was started during



VIEW SHOWING HEADWORKS AND FALLING SHUTTER SECTION OF DAM, AGANAO RIVER IRRIGATION SYSTEM, ILOILO PROVINCE

1923. These projects will furnish potable water to a total population of 44,000 at an estimated cost of ₱590,000. Preliminary designs and estimates were also made for 18 provincial and municipal projects, most of which are to be financed from loans or bond issues.

Construction work was completed by District Engineers on 8 waterworks projects started during previous years, leaving 35 active construction projects at the end of the year. The 8 completed projects cost ₱256,150.69 and serve a total population of 14,670, while projects still under way are estimated to cost ₱1,746,000, and will provide a potable water supply for 114,000 people.

There are 86 waterworks projects under consideration which contemplate furnishing water to a total population of 360,000 and are estimated to cost approximately ₱4,000,000. Preliminary designs and estimates have been prepared for practically all of these projects and construction work may therefore be undertaken as soon as the municipalities concerned are able to finance same.

The 113 municipal and provincial waterworks (not including the system in the City of Manila) which have been completed thus far in the Islands supply potable water to a total population of 442,000 and have cost about ₱3,900,000. The operation and maintenance of these waterworks are, as a rule, under the jurisdiction of municipal councils; some of the larger systems being administered by waterworks boards appointed by executive orders. With a view to providing for more efficient management, and the placing of operation and maintenance of completed systems under the direct supervision of district engineers, the Division has drafted a set of "general regulations to govern the administration, operation, and maintenance of municipal and provincial waterworks." These regulations are still pending approval by the Department of the Interior.

The status of all waterworks projects to date is shown in the accompanying lists as follows:

List A.—Waterworks projects under construction.
List B.—Waterworks projects completed.
List C.—Waterworks projects under consideration.

List A.—Waterworks projects under construction

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Abra (Ilocos Sur)	Bangued	Gravity	6,600	₱130,000.00	₱80,000.00	₱40,000.00
Batangas	Bauan [a]	Pumping	4,700	65,000.00	20,000.00	10,000.00
Do.	Lemery	do.	7,200	45,000.00	28,000.00	15,411.19
Do.	Taal Extension	do.	4,000	69,000.00	40,000.00	20,000.00
Do.	Tanauan [a]	Gravity	2,500	57,000.00	20,000.00	20,000.00
Bohol	Loon	do.	5,000	33,000.00	22,000.00	11,000.00
Bulacan	Malolos	Pumping	6,000	140,000.00	25,000.00	21,594.57
Cavite	Cavite [a]	do.	10,911	140,000.00	24,000.00	12,500.00
Do.	Indang	do.	3,000	42,000.00	20,000.00	10,213.00
Do.	Silang [a]	Gravity	4,000	60,000.00	20,000.00	10,000.00
Cebu	Carcar (Improvement) [a]	do.	8,000	87,000.00	48,000.00	38,500.00
Do.	Dalaguete Extension	Pumping	3,500	57,000.00	5,000.00	2,500.00
Laguna	Magdalena	Gravity	3,000	69,000.00	40,000.00	21,210.79
Mountain Province	Apayao (Kabuyao)	do.	800	7,000.00	5,000.00	
Do.	Baguio	Pumping and gravity	6,000	150,000.00	85,000.00	57,830.00
Do.	Kiangan [a]	do.		7,000.00		6,643.40
Do.	Lubuagan	Gravity		12,000.00	5,000.00	
Nueva Ecija	Cabanatuan	Pumping	6,000	110,000.00	70,000.00	40,000.00
Oriental Negros	Dumaguete	do.	4,000	84,988.00	48,200.00	24,100.62
Do.	Maria Extension	Gravity	1,000	3,000.00	2,000.00	1,000.00
Palawan	Bacuit	do.	1,000	3,200.00	2,500.00	700.00
Do.	Balabac Extension	do.	800	5,000.00	3,200.00	
Do.	Barrio Bintuan	do.	1,000	5,500.00	3,700.00	1,000.00
Do.	Culion [a]	Gravity and pumping	4,389	35,000.00	25,000.00	
Do.	Cuyo	Pumping	800	10,000.00	6,650.00	3,000.00
Do.	Oton	Gravity	328	5,000.00	3,000.00	
Do.	Puerto Princesa					
Do.	Bacons	Pumping		3,300.00	2,200.00	
Pampanga	Arayat	Gravity	3,840	35,000.00	12,800.00	11,400.00
Pangasinan	Alcala [a]	do.	2,200	3,000.00	1,000.00	2,000.00
Romblon	Looc [a]	do.	2,000	32,000.00	17,000.00	15,000.00
Samar	Catbalogan	do.	2,000	63,000.00	40,000.00	20,000.00
Tarlac	Moncada [a]	do.	3,000	24,000.00		8,000.00
Tayabas	Pagbilao [a]	do.	2,300	90,000.00	20,000.00	10,000.00
Zambales	San Antonio	do.	4,000	75,000.00	25,000.00	[b]
Total			113,868	1,745,988.00	769,650.00	433,603.57

[a] Projects begun in 1923.

[b] One-third cost guaranted by municipal council and provincial board.

List B.—Waterworks projects completed

Province	Municipality	Population served	Cost	System	Capacity of system gallon per day
Albay	U. S. Reservation Regan Barracks, Albay and Legaspi.	5,000	₱60,000.00	Crude oil and steam pumping.	259,200
Antique	San Jose	4,000	41,846.74	Pumping	47,520
Batangas	Balayan	2,000	7,353.92	Gravity	100,000
Do	Batangas	6,147	71,529.95	Pumping	144,000
Do	Cuenca	2,500	5,000.00	Gravity	5,040
Do	Lipa	5,000	103,065.87	Pumping	172,800
Do	San Jose	4,000	44,099.45	Gravity	216,000
Do	Santo Tomas (Kalaw).	1,910	27,108.65	do.	50,400
Do	Taal	5,000	91,188.34	Pumping	187,200
Bohol	Davis	840	5,100.00	Gravity	77,760
Do	Duero	2,000	10,825.55	do.	86,400
Do	Jagna	3,000	24,115.26	do.	43,200
Do	Loay	3,000	18,968.72	do.	144,000
Do	Mabini	1,300	6,550.00	do.	72,000
Do	Tagbilaran	5,245	13,837.47	Pumping	77,760
Do	Tubigon	4,800	34,094.06	do.	100,800
Bukidnon	Deliric	600		Gravity	4,320
Do	Malaybalay	1,300	11,641.16	do.	20,160
Do	San Luis	500	650.00	do.	

LIST B.—*Waterworks projects completed*—Continued

Province	Municipality	Population served	Cost	System	Capacity of system gallon per day
Bulacan	Marilao	[b]	22,101.50	do.	
Do	Hagonoy	2,769	7,564.87	do.	50,400
Do	Sibul, S. Miguel	[c]	256,000.00	do.	
Camarines Norte	Mambulao	No data	1,200.00	Gravity	
Capiz	Capiz	6,400	13,541.92	Concrete tank	[e] 264,170
Cavite	Mendez-Nuñez [a]	1,600	60,700.00	Pumping and Hydraulic electric.	57,600
Cebu	Barili	2,067	26,958.25	Gravity	61,200
Do	Carcar	4,463	64,004.45	do.	216,000
Do	Catmon	1,624	16,559.55	Pumping	
Do	Cebu	65,000	515,540.13	Gravity	806,400
Do	Cebu–Labangon	[d]	16,000.00	do.	576,000
Do	Cebu–Sambag	[d]	35,789.18	Pumping	187,200
Do	Cordova [a]	1,191	4,810.74	Rain tank	[e] 30,000
Do	Daanbantayan [b]	579	5,972.99	do.	30,000
Do	Dalaguete	2,480	14,941.15	Pumping	36,000
Do	Dumanjug	1,500	25,638.29	do.	187,200
Do	Ginatilan	2,669	13,484.80	Gravity	43,200
Do	Malabuyoc	1,500	14,941.15	do.	104,544

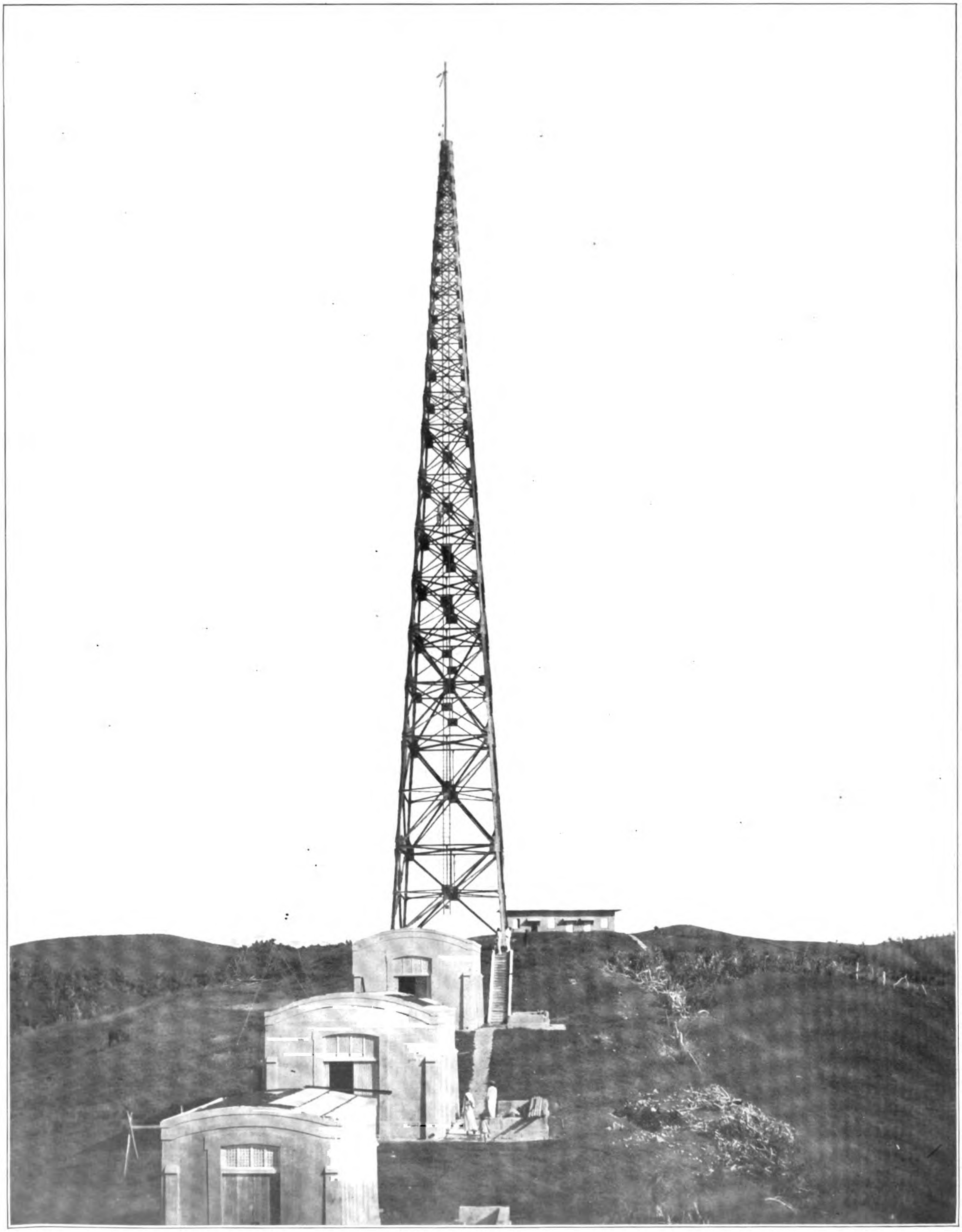
[a] Projects completed in 1923.

[b] Bath house.

[c] Spring improvement.

[d] Part of Cebu.

[e] Gallon tank.



SANTO DOMINGO DE BASCO RADIO STATION, BATANES ISLANDS. STOWING TOWER, OPERATING BUILDINGS AND QUARTERS

List B.—Waterworks projects completed—Continued

Province	Municipality	Population served	Cost	System	Capacity of system gallon per day
Cebu	Moalboal	2,108	14,297.27	Gravity	54,720
Do	Opon [a]	1,500	36,414.18	Pumping	144,000
Do	Oslob Barrio				
Do	Mainit		2,000.00	Gravity	
Do	Pilar	702	5,019.21	do	14,400
Do	Poro	1,000	8,873.63	do	21,600
Do	Naga	3,233	6,800.00	do	79,200
Do	Naga Extension	(b)	4,552.48	do	
Do	Samboan	2,741	7,514.11	do	49,248
Do	San Fernando	1,243	6,200.00	do	
Do	Sibonga	2,661	35,300.00	do	63,360
Do	Tuburan [a]	3,900	55,304.20	do	120,960
Do	Tudela	851	8,263.29	do	24,480
Cotabato	Parang	600	9,600.00	Hydraulic ram.	21,600
Davao	Davao	6,000	137,193.14	Gravity	86,400
Ilocos Sur	Vigan	8,440	127,399,52	do	201,600
Isabela	Ilagan	(c)	(i)	do	
Laguna	Bay	1,471	2,767.72	do	86,400
Do	San Pablo	7,000	89,455.82	do	576,000
Do	Santa Cruz	6,000	92,692.43	Pumping	352,600
Do	Majayjay	3,200	58,686.06	Gravity	187,200
Do	Nagcarlan	2,500	35,890.37	do	180,600
Do	Pagsanjan	4,044	73,782.57	Pumping	233,280
Marinduque	Boac	1,000	6,653.00	Pumping	57,600
Do	Gasan [a]	1,400	22,124.97	do	144,000
Do	Malbog [a]	1,000	13,614.29	Gravity	61,920
Do	Mogpog	1,280	10,535.69	do	10,288
Do	Santa Cruz	2,560	20,696.23	do	158,400
Mindoro	Abra de Ilog	350	4,743.74	do	14,400
Do	Calapan	2,500	29,743.47	Pumping	57,600
Misamis	Baliñgasag	1,514	8,921.14	Gravity	57,600
Do	Cagayan	3,000	50,408.82	Pumping	86,400
Do	Mahinog	5,727	6,000.00	Gravity	
Do	Mambajao	14,446	30,000.00	do	
Do	Sagay	6,321	800.00	do	
Mountain Province	Cervantes	800	7,565.07	do	
Do	Teachers' Camp and Country Club.	1,500	(f)	do	216,000
Do	Mansion house	100	(g)	Pumping	
Do	Trinidad Farm School.	300	19,330.93	Gravity	36,000
Do	Trinidad Stock Farm.	60	2,000.00	do	8,640
Oriental Negros	Bagac	265	(f)	Hydraulic ram.	
Do	Siquijor Barrio	494			
Do	Talingting Barrio.				
Do	Lawi	2,300	6,960.77	Gravity	
Do	Luzuriaga	2,500	12,317.44	do	249,200
Do	Maria	1,000	1,353.05	do	3,600
Do	Siquijor	2,890	5,025.00	do	6,480
Do	Siquijor, Poblacion.	1,587	19,000.00	do	
Palawan	Coron	1,150	7,844.63	Pumping	20,160
Do	Puerto Princesa	716	10,268.45	do	28,800
Pampanga	Angeles	6,708	12,318.52	Steam Pumping.	61,920
Do	San Fernando	1,000	1,050.02	Pumping	86,400
Pangasinan	Bani	2,000	12,411.56	Gravity	86,400
Do	Bayambang	2,400	8,652.80	do	108,000
Do	Dagupan	(d)	2,023.02	do	
Do	Lingayen	(d)	3,938.99	do	
Do	do	(e)	9,141.22	do	
Do	Mangaldan	(d)	635.53	do	122,400
Do	San Fabian	(d)	682.87	do	57,600
Rizal	Antipolo	2,250	23,299.07	Pumping	82.060
Do	Pasig	10,000	40,000.00	do	86,400
Romblon	Romblon	2,300	(f)	Gravity	
Samar	Calbayog	(d)	(f)	Rain tank	[h] 20,000
Do	Oras	4,000	(f)	Gravity	
Sorsogon	Bacon	3,200	21,000.00	do	79,200
Do	Magallanes	3,500	8,000.00	Pumping and gravity.	
Do	Sorsogon	250	1,044.67	Pumping	36,000
Sulu	Jolo	722	76,974.29	do	115,200
Surigao	Bauang Barrio, Gigaquit.	2,405	7,500.00	Gravity	
Do	Lianga	1,290	1,924.56	do	2,880
Do	Placer	870	13,133.95	do	18,720
Tayabas	Lucban	3,200	50,205.60	do	316,600
Do	Lucena	7,500	234,390.57	do	432,000
Do	Mauban [a]	3,500	57,209.32	Pumping	144,000
Do	Sariaya	6,000	37,935.00	Gravity	201,600
Do	Tayabas	4,600	125,159.36	do	432,000
Zambales	Subic	1,628	10,670.82	do	11,520
Zamboanga	Zamboanga	5,000	305,561.30	Gravity and Hydraulic electric.	504,000
Total		442,281	3,864,363.01		

[a] Projects completed in 1923.
[b] Part of Naga.
[c] Constabulary tank.
[d] Market.
[e] School.
[f] No record.
[g] Not available.
[h] Gallon tank.

List C.—*Waterworks projects under consideration*

Province	Municipality	Estimated cost	Population to be served	System
Albay	Guinobatan	54,000.00	5,000	Gravity.
Do.	Tabaco	45,000.00	5,500	Do.
Do.	Viga	15,000.00	3,316	Do.
Antique	Bugasong			No data.
Batanes	Ivara	40,000.00	2,000	Gravity.
Do.	Sabtang		748	No data.
Batangas	Balayan Extension	1,500.00		Gravity from Balayan tank.
Do.	Rosario	30,000.00	5,000	Pumping.
Bohol	Anda	22,000.00	2,500	Gravity.
Do.	Antequera	9,000.00	2,600	Do.
Do.	Calape	30,000.00	2,600	Do.
Do.	Carmen	6,100.00	600	Do.
Do.	Corella	6,000.00	1,019	Do.
Do.	Garcia-Hernandez	37,500.00	2,000	Do.
Do.	Inabanga	63,000.00	4,000	Do.
Do.	Loay Extension	3,200.00	500	Do.
Do.	Loboc	27,000.00	3,000	Do.
Do.	Tagbilaran Improvement	36,000.00		Pumping.
Do.	Valencia	20,000.00	1,435	Gravity.
Bukidnon	Impasugong	35,000.00	1,600	Do.
Bulacan	Pulilan	18,000.00	3,000	Do.
Do.	San Ildefonso	45,000.00	2,500	Pumping.
Do.	San Miguel	50,000.00	2,308	Do.
Cagayan	Aparri	345,000.00	9,198	Do.
Do.	Camalaniugan		2,348	
Do.	Lal-lo		1,392	
Do.	Tuguegarao	201,000.00	12,000	Do.
Camarines Sur	Camaligan	300,000.00	14,000	Gravity.
Do.	Canaman			
Do.	Magarao			
Do.	Naga			
Capiz	Panay	3,000.00		Rain tank.
Cebu	Alegria	19,000.00	1,000	Gravity.
Do.	Asturias	92,000.00	1,086	Pumping.
Do.	Argao	45,000.00	4,500	Gravity.
Do.	Balamban	31,000.00	4,818	Do.
Do.	Dumanjug Extension	32,000.00	3,210	Gravity instead of pumping.
Do.	Malabuyoc Extension	3,000.00	800	Gravity.
Do.	Mandaue	45,000.00	2,500	Pumping.
Do.	Moalbual Extension	25,200.00	3,000	Gravity.
Do.	Oslob	15,000.00	2,000	Do.
Do.	Ronda	15,000.00	1,880	Pumping.
Do.	San Fernando	30,000.00	3,050	Gravity.
Do.	San Isidro	2,100.00	650	Do.
Do.	Sogod	15,000.00	2,200	Do.
Do.	Talisay	30,000.00	3,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Rain and gravity.
Ilocos Norte	Laoag (Metropolitan)	880,000.00	25,000	Gravity.
Ilocos Sur	Bantay	15,000.00	2,500	Do.
Do.	Santa Lucia		1,908	No data.
Do.	Santa	28,000.00	875	Gravity.
Iloilo	Iloilo Metropolitan	1,703,000.00	84,000	Do.
Do.	Pototan-Dingle	279,000.00	9,200	Do.
Isabela	Ilagan		2,539	No data.
Laguna	Alaminos	30,000.00	1,127	Gravity.
Do.	Calamba	85,000.00	7,000	Pumping.
Do.	Lilio	40,000.00	4,500	Gravity.
Do.	Luisiana	60,000.00	1,811	Pumping.
Do.	Pila	60,000.00	2,171	Do.
Do.	Rizal	27,000.00	3,000	Gravity.
Lanao	Dansalan		2,000	Hydro-electric.
La Union	Rosario	13,500.00	1,050	Gravity.
Do.	San Fernando	83,000.00	5,000	Do.
Leyte	Baybay	15,000.00	6,000	Pumping.
Do.	Burauen		3,038	Gravity.
Do.	Liloan	10,000.00	700	Do.
Do.	Maasin	15,000.00	3,300	Do.
Do.	Tacloban		6,532	No data.
Mindoro	Looc		1,623	Do.
Do.	Caluya		1,477	Do.
Misamis	Misamis	66,000.00	3,450	Pumping.
Marinduque	Torrijos	21,000.00	5,000	Gravity.
Palawan	Cagayancillo		1,066	Rain water tank.
Do.	Concepcion	3,600.00	500	Gravity.
Do.	Coron Improvement	19,000.00		Do.
Pangasinan	Lingayen	27,000.00	2,831	Do.
Do.	Dagupan		4,436	No data.
Do.	Malasiqui	30,000.00	2,613	Pumping.
Do.	San Manuel	52,000.00	4,375	Gravity.
Rizal	Pasig Extension	27,000.00	5,200	Pumping.
Romblon	Despujol			No data.
Do.	Odiongan			Do.
Samar	Calbayog	20,000.00	5,907	Do.
Do.	Llorente	14,000.00	2,500	Pumping.
Sorsogon	Barcelona	23,500.00	4,000	Gravity.
Do.	Sorsogon	76,000.00	6,600	Do.
Surigao	Surigao	70,000.00	6,400	Do.
Tarlac	Tarlac			Pumping.
Tayabas	Candelaria	56,000.00	3,500	Gravity.
Do.	Malanay	33,000.00	1,200	Do.
Do.	Tiaong	48,000.00	1,800	Do.
Total		5,836,200.00	361,324	

APPENDIX

PROJECTS ACTIVE, JANUARY 1, 1924

Provinces	Roads and trails				Bridges and culverts				Provincial administration buildings				Municipal administration buildings				Prisons			Schools				Construction and operation										Total
	Construction	Maintenance	Repair	Reconstruction	Construction	Maintenance	Repair	Reconstruction	Construction	Maintenance	Repair and alteration	Reconstruction	Construction	Maintenance	Repair and alteration	Reconstruction	Construction	Repair and alteration	Maintenance	Construction	Maintenance	Repair and alteration	Reconstruction	Markets and tiendas	Parks, grounds, and athletic fields	Miscellaneous buildings	Ferries	Water systems	Automobile lines	Quarries	Telephone lines	Electric light plants	Miscellaneous	
Abra	5	4																		2								1			1			13
Agusan	2	4																													2		4	12
Albay	3	4			1					1											1												4	14
Antique	5	2																		1													1	9
Bataan	2	4			1						1		1							4											1		4	18
Batangas	4	3								2										3	1			1	2			5				3	20	44
Benguet	1	4																			1					4							2	12
Bohol	5	3			1				1				2							1					2	2		3					4	24
Bukidnon		2																															1	3
Bulacan	5	3	1		1															5		1						1					8	25
Cagayan	1	2																		1													9	13
Camarines Norte	2	3			1																												1	7
Camarines Sur	4	3	1							1			1			1					2				1								3	17
Capiz	4	2																		1				1									4	12
Cavite	15	4			2																							3					2	26
Cebu	3	2							1											4								2					8	20
Cotabato	4	4																		1				1			1				2		8	21
Davao	4	4	1								1											2					1						12	25
Ilocos Norte	3	2			1				1				1			1				3			1	1									3	17
Ilocos Sur	3	3			2											1				4							1						2	16
Iloilo	4	2							1									1		2						3							9	22
Isabela	5	2																		5													1	14
Laguna	6	3		1																2								1					1	14
Lanao	4	3		1									1											1									7	16
La Union	4	5		1									2							4		1			1									18
Leyte	2	2							1				4							1					1	2					1		5	19
Manila																										21							42	63
Marinduque	2	2																						1		2							3	10
Masbate		2		1																1													2	6
Mindoro	3	6			4					2			1		1		1		1	2	2				1	1					1		2	28
Misamis		2		1																														3
Mountain Province	3	2			1								2							2		1						3			1		10	25
Nueva Ecija	8	5		1	1															7		1		2			1	1					6	33
Nueva Vizcaya	5	5																						1			1				1		3	16
Occidental Negros	8	2										1								6				1									1	19
Oriental Negros	5	5																										2					5	17
Palawan																																		
Pampanga	1	3		1	3								3		1					2		1		1	1			1					30	48
Pangasinan	8	2			4								2							7		5	1					2					7	38
Rizal	3	3			2								2		1					5		1			1								3	21
Romblon	1	1									1									3								1					2	9
Samar	5	2			1																	1		1				1					6	17
Sorsogon	2	3																		3				1									1	10
Sulu	1	3		1																	2				2	2							14	25
Surigao	3	2									1									2													2	10
Tarlac	4	2											1							1					2	3		1					2	16
Tayabas	4	4		1	1		1	1												3					3	7		2					4	31
Zambales	3	2					1													2		1						1			1		1	12
Zamboanga	3	7																		2					1	4							12	29
Total	172	144	3	8	28		2	1	5	6	4	1	23		3	3	1	1	1	92	9	15	2	13	18	51	5	31			11	3	281	937

NOTE.—Of the 281 projects under the caption "Miscellaneous," there are 11 wireless stations, 35 surveys and investigations of roads, market sites, bridge sites, etc., 3 docks, 44 artesian wells, 12 port works maintenance, 1 harbor maintenance, 10 irrigation systems, 13 wharves, 11 river control projects, 2 customhouses, 2 dredging projects, 12 dykes, 23 Constabulary buildings, 2 irrigation ditches, 9 water tanks, 21 hospitals, 4 piers, 1 dam, 1 monument, and 63 other less important projects.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1924]

JOSE PAEZ, *Director of Public Works*
MARCIAL KASILAG, *Chief Constructing Engineer*
E. C. EARLE, *Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer*
TOMAS MAPUA, *Supervising Architect*
JUAN ARELLANO, *Supervising Architect*

CENTRAL OFFICE ORGANIZATION

ADMINISTRATIVE DIVISION

- Rosendo Reinoso, Chief, Administrative Division, and Chief Accountant.
  - Francisco Cruz, Chief Clerk.
  - T. Camu, Cashier and Disbursing Officer.
  - Primo Villar, Law and Records Clerk.
  - Jose de Jesus, Property Clerk.
  - Salvador Reyes, Acting Superintendent of Automobiles.

DESIGNING DIVISION

- W. J. Grodske, Project Engineer.
  - L. L. Vincent, E. and M. E.
  - L. H. Thompson, E. and M. E.
  - J. C. Cookingham, C. E.
  - R. S. Clemons, E. and M. E.
  - Lope Gonzaga, Chief Electrician.
  - J. Vallarta, C. E.
  - D. Guanio, C. E.
  - J. Piedad, C. E.
  - E. Segui, C. E.
  - A. Villanueva, Asst. C. E.
  - V. Gloria, Asst. C. E.
  - V. Villanueva, Asst. Electrical Engineer.
  - Ciriaco Coronel, Asst. E. and M. E.
  - Manuel Felizardo, Asst. M. E.
  - W. Berry, Pile Driver Superintendent.

DIVISION OF ARCHITECTURE

- Cheri Mandelbaum, Architect.
  - Antonio Toledo, Architect.
  - Antonio Tayzen, C. E.
  - Gonzalo T. Vales, C. E.
  - Teodato P. Macabulos, C. E.
  - Frank F. Reynolds, Asst. Engineer.
  - Ambrosio Dias, Jr. C. E.
  - Juan Altiveros, Architect.

CONSTRUCTING DIVISION

- E. D. Smith, Div. E., First Division.
- Melecio Arranz, Div. E., Second Division.
- Luis Francisco, Div. E., Third Division.
- Vicente Fragante, Div. E., Fourth Division.
- N. S. Saleeby, Div. E., Fifth Division.
- Juan Macaraeg, Div. E., Sixth Division.
- A. T. Sylvester, Constructing Engineer.
- V. L. Legarda, C. E., Superintendent, Maintenance, Alteration and Repair.
- H. C. Garretson, C. E.
- Isabelo Lagniton, C. E.
- H. Franco, Chief Electrician.
- V. Castillo, Superintendent of Dredges.
- R. Custodio, Superintendent of Construction.
- J. A. V. Corpus, M. E., Superintendent of Artesian Wells.
- Q. Camus, Traveling Inspector.

IRRIGATION DIVISION

- Emilio Quisumbing, Designing Engineer.
- Nicanor Cortes, Designing Engineer.
- Angel Martinez, Asst. Designing Engineer.
- W. J. Lamon, Project Engineer.
- E. L. Driggs, Project Engineer.
- Leon Ines, Project Engineer.
- Gonzalo Garcia, Project Engineer.
- Ricardo Nostratis, Project Engineer.
- H. O. Bauman, Project Engineer.
- Gaudioso Cruel, Project Engineer (Acting).
- Hilario Clemente, C. E.
- Manuel Gonzalez, C. E.
- Gregorio de Leon, C. E.
- Deogracias de la Paz, C. E.
- Julian Buendia, Asst. C. E.
- Miguel Garcia, Asst. C. E.
- Faustino Salvador, Asst. C. E.
- Agapito Alano, Asst. C. E.
- Graciano J. Militante, Asst. C. E.
- Prudencio F. Esquivel, Asst. C. E.
- Vicente Alcañeses, Jr. C. E.
- Fernando Arnaldo, Jr. C. E.
- Ramon C. Caloya, Jr. C. E.
- Jacinto Gochoco, Chief Hydrographer.
- W. Demers, Supervising Hydrographer.
- Antonio Baldonado, District Hydrographer.
- Manuel Trani, Asst. Hydrographer.
- Francisco Aquino, Asst. Hydrographer.
- P. del Castillo, Jr. Hydrographer.
- Artemio Abaya, Chief Water Rights Inspector.
- Modesto Villalobos, Asst. Chief Water Rights Inspector.
- Mariano N. Leones, Supervising Surveyor.
- John P. Utinsky, Overseer.

DISTRICT ORGANIZATION

- E. J. HALSEMA, D. E., Baguio, Benguet.
- E. D. Smith, Div. E., Manila.
  - Rosalio Villalon, Acting D. E., Ilocos Norte.
  - Tomas Lorenzo, Asst. C. E., Ilocos Norte.
  - Arturo P. Nitorreda, D. E., Ilocos Sur.
  - Benito Eulogio, Jr. C. E., Ilocos Sur.
  - Manuel Diaz, Acting D. E., La Union.
  - Deogracias L. Pablo, Asst. C. E., La Union.
  - Roque Peredo, Acting D. E., Mt. Province.
  - Adriano Medina, Jr. C. E., Mt. Province.
  - Saturnino Lopez, D. E., Pangasinan.
  - Fidel Larracas, C. E., Pangasinan.
  - Jose Gandionco, C. E., Pangasinan.
  - Mariano D. Rico, Asst. C. E., Pangasinan.
  - Jaime Laguardia, Acting D. E., Tarlac.
  - Gil R. Mallare, Asst. C. E., Tarlac.
- Melecio Arranz, Div. E., Manila.
  - Mamerto Cruz, D. E., Cagayan.
  - Rafael Ungson, Asst. C. E., Cagayan.
  - Bernabe V. Gregorio, Asst. C. E., Cagayan.
  - Vicente Oledan, Acting D. E., Nueva Vizcaya.
  - Martin Pulido, Asst. C. E., N. Vizcaya.
  - Vicente Orosa, Acting D. E., Nueva Ecija.
  - Ariston Florendo, Asst. C. E., N. Ecija.
  - Pedro C. Diaz, Asst. C. E., N. Ecija.
  - Mariano A. de Castro, Acting D. E., Pampanga.
  - Francisco Katigbak, Asst. C. E., Pampanga.
  - Joaquin Galza, Acting D. E., Bataan.
  - Severino Fernandez, D. E., Bulacan.
  - Juan G. Paraiso, Asst. C. E., Bulacan.
  - Lorenzo Ortiz, Acting D. E., Rizal.
  - A. Fernandez de Castro, Asst. C. E., Rizal.
  - Luis Novenario, Hydrographer, Rizal.
  - Francisco Alvarez, Acting D. E., Cavite.
  - Nicolas L. Cuenca, Asst. C. E., Cavite.
  - Ramon Borromeo, Asst. C. E., Cavite.
  - Abelardo R. Icasiano, Acting D. E., Zambales.
  - Lorenzo J. Samonte, Asst. C. E., Zambales.
- Luis Francisco, Div. E., Manila.
  - Jose Villanueva, In Charge of Office, Batangas.
  - Martin M. Resplandor, Jr. C. E., Batangas.
  - Bonifacio Villanueva, Acting D. E., Laguna.
  - Jose Villaroel, Asst. C. E., Laguna.
  - Pedro Q. Pabello, Jr. C. E., Laguna.
  - Dalmacio Urtula, D. E., Tayabas.
  - Aurelio N. Cobangbang, Asst. C. E., Tayabas.
  - Homobono H. Gonzalez, D. E., Mindoro.
  - Alfredo V. Martinez, Acting D. E., Camarines Norte.
  - Silvestre Tan Chauco, Acting D. E., Camarines Sur.
  - Antonio R. Soriano, Asst. C. E., Camarines Sur.
  - J. V. Bagtas, D. E., Albay.
  - Andres Bolinas, J., Asst. C. E., Albay.
  - Emilio Buenaventura, Asst. C. E., Albay.
  - Sergio Bayan, Acting D. E., Sorsogon.
  - Roque F. Tabuena, Asst. C. E., Sorsogon.
- Vicente Fragante, Div. E., Manila.
  - Jose Wright, Acting D. E., Marinduque.
  - Alejo Aquino, D. E., Iloilo.
  - Jose Arquisola, Jr. C. E., Iloilo.
  - Isaias Fernando, D. E., Capiz.
  - Luis M. Sirilan, Asst C. E., Capiz.
  - Hospicio I. Fernandez, Acting D. E., Antique.
  - Filomeno Piczon, Acting D. E., Romblon.
  - Jose Lozada, Acting D. E., Occ. Negros.
  - Alejandro Rivera, Asst. C. E., Occ. Negros.
  - Manuel T. Tubungbanua, Asst. C. E., Occ. Negros.
- N. S. Saleeby, Div. E., Manila.
  - Valeriano Segura, D. E., Cebu.
  - Pedro Formilleza, Asst. C. E., Cebu.
  - Rufino Garcia, Acting D. E., Bohol.
  - Jose Follosco, Asst. C. E., Bohol.
  - Pedro M. Lladoc, Asst. C. E., Bohol.
  - H. R. Meehleib, Acting D. E., Leyte.
  - Liborio Urtizberea, Asst. C. E., Leyte.
  - Leandro Espejo, Asst. C. E., Leyte.
  - Pastor Avisado, Acting D. E., Samar.
  - Alberto C. Centeno, Asst. C. E., Samar.
  - Ambrosio Osmeña, Acting D. E., Or. Negros.
  - Carlos Rodriguez, Jr. C. E., Oriental Negros.
  - Teodoro Mecorro, Acting, D. E., Masbate.
- Juan Macaraeg, Div. E., Zamboanga.
  - Juan Macaraeg, D. E., Zamboanga.
  - B. F. Saldaña, Acting D. E., Cotabato.
  - Gregorio Alcantara, Acting D. E., Davao.
  - W. J. Hollis, Acting D. E., Sulu.
  - Cirilo Cabilete, Acting D. E., Lanao.
  - Roy N. Allen, Acting D. E., Misamis.
  - Marcelo Operario, Jr. C. E., Misamis.
  - Roy N. Allen, Acting D. E., Bukidnon.
  - Mariano F. Chiyuto, Acting D. E., Agusan-Surigao.

LEGEND

Div. E. = Division Engineer.
C. E. = Civil Engineer.
D. E. = District Engineer.
Asst. C. E. = Assistant Civil Engineer.
Jr. C. E. = Junior Civil Engineer.
E. & M. E. = Electrical and Mechanical Engineer.

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THE BUREAU OF PUBLIC WORKS

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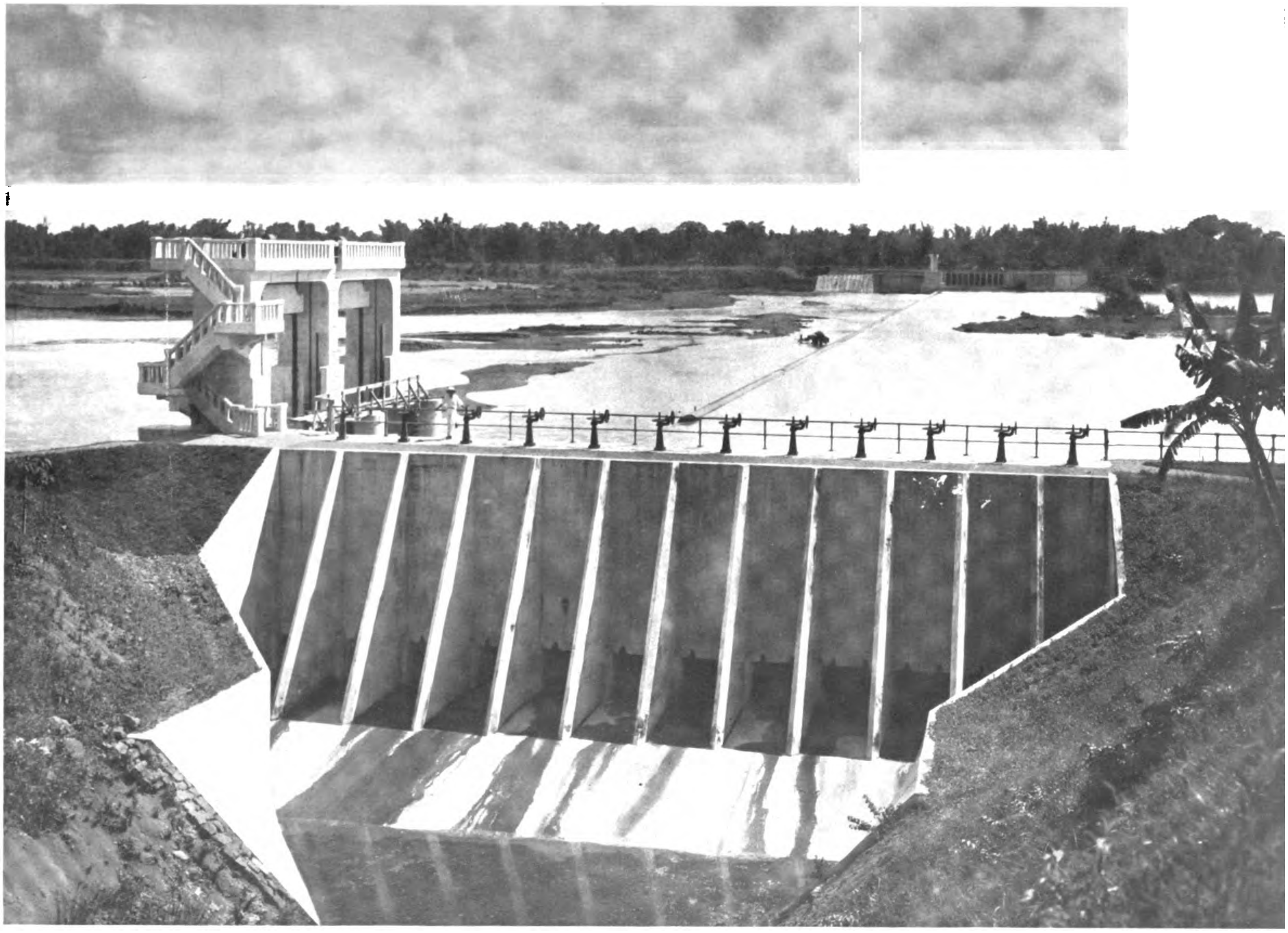
BULLETIN

Vol. 13 JANUARY 1, 1925 No. 1



VIEW FROM SOUTH HEADGATES, DIVERSION WORKS, ANGAT RIVER IRRIGATION PROJECT, BULACAN PROVINCE

214081

CONVERSION TABLE

One peso (₱) = 50 cents, U. S. currency.

One kilometer (Km.) = 0.62 mile.

One kilogram (Kg.) = 2.20 pounds (lbs.).

One centimeter (cm.) = 0.39 inch.

One meter (m.) = 3.28 feet.

One hectare = 2.47 acres.

One cubic meter (cu. m.) = 1.31 cubic yards.

One hectare meter per day = 8.107 acre feet per day.

One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) second feet.

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1924

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, P. I., March 2, 1925

SIR: I have the honor to submit herewith the Report of the Bureau of Public Works for the Fiscal Year ending December 31, 1924.

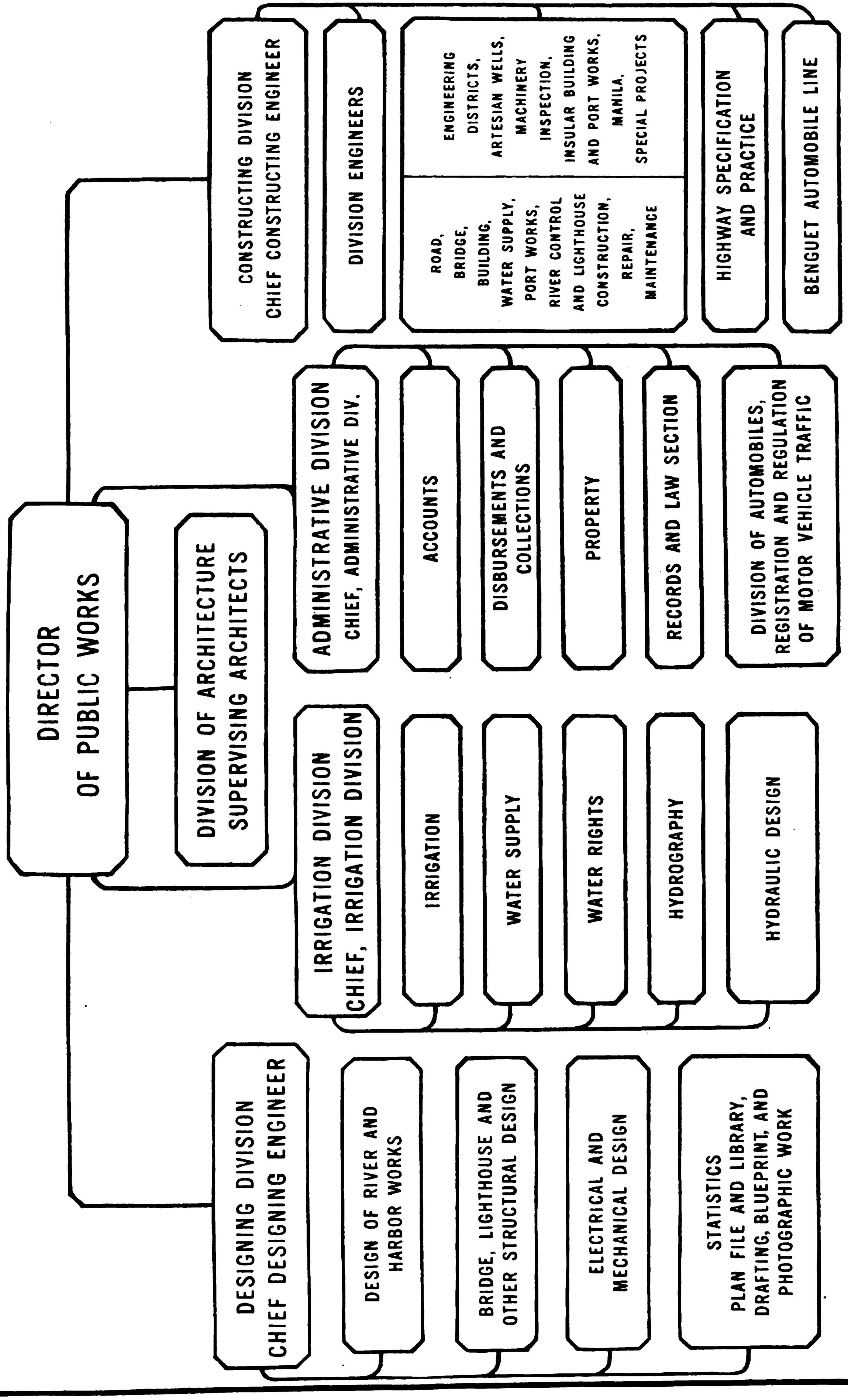
Very respectfully,

A. D. WILLIAMS
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1924


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS PLAN FILE AND LIBRARY, DRAFTING, BLUEPRINT, AND PHOTOGRAPHIC WORK
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
ADMINISTRATIVE DIVISION CHIEF, ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
DIVISION ENGINEERS
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE

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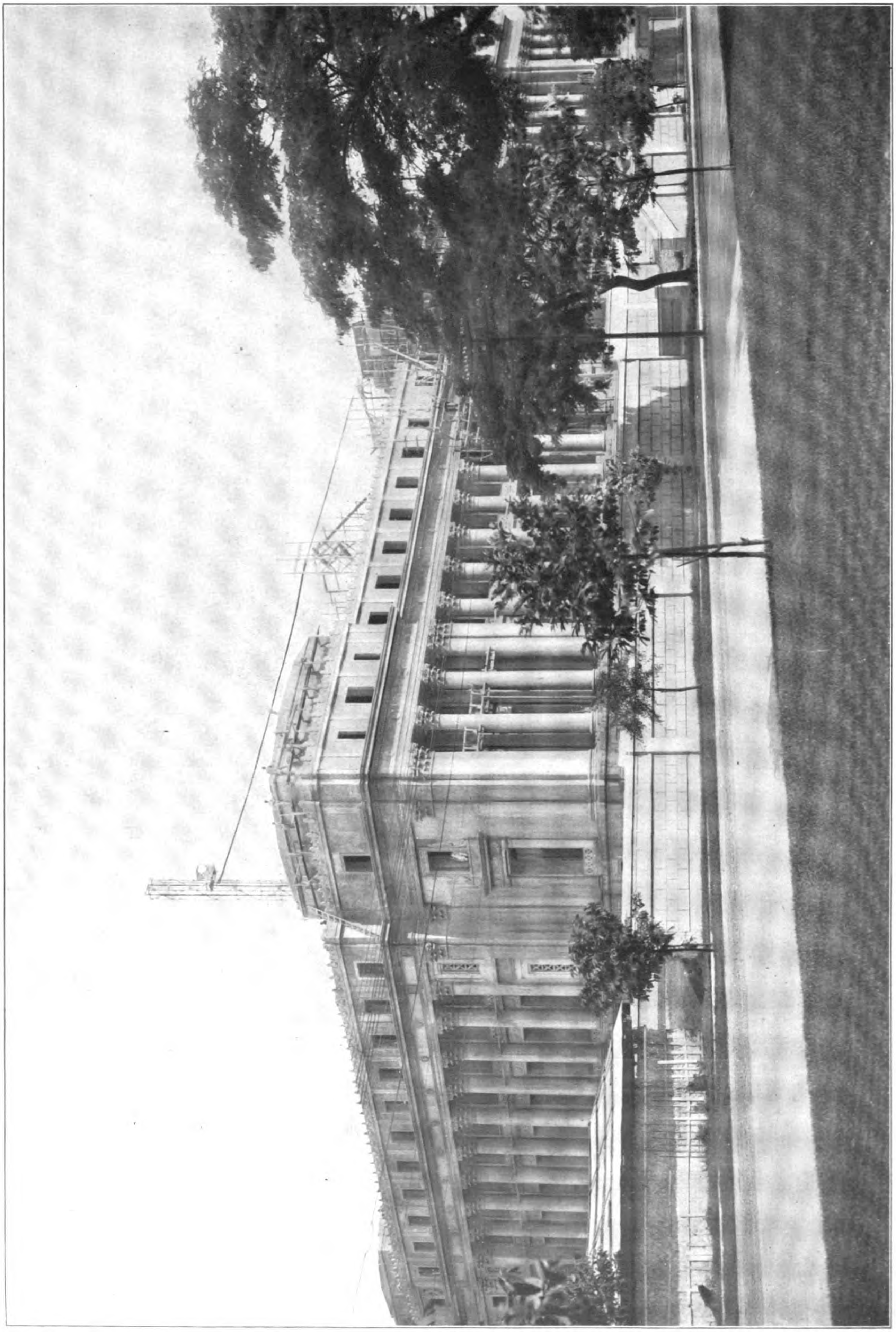


INSULAR GOVERNMENT BUILDING, MANILA

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and the principal functions of the Bureau of Public Works are shown in the accompanying organization diagram. The Philippine Islands are now divided into 47 engineering districts with a district engineer in charge of each district, who is the local representantive of the Bureau. The Central Office in Manila prepares plans and specifications for construction projects and exercises general supervision over all activities.

PERSONNEL

Number of employees paid direct from Bureau and Project Funds as of December 31, 1924: Americans, 19; Filipinos, 357.

(NOTE.—The corresponding figures for December 31, 1923, are 18 and 367, respectively.)

Number of technical employees, December 31, 1924: Americans, 17; Filipinos, 141.

(NOTE.—The corresponding figures for December 31, 1923, are 16 and 122, respectively.)

Americans technical employees

Position	Classified	Unclassified	Total
Civil engineer	9	1	10
Assistant engineer	1	1	2
Electrical and mechanical engineer	2	1	3
Surveyor	1	0	1
Architect	1	0	1
Total	14	3	17

Filipino technical employees

Position	Classified	Unclassified	Total
Civil engineer	39	13	52
Assistant engineer	0	0	0
Assistant civil engineer	41	24	65
Junior civil engineer	4	6	10
Mechanical engineer	0	1	1
Assistant mechanical and electrical engineer	0	1	1
Assistant electrical engineer	1	0	1
Junior electrical engineer	1	0	1
Surveyor	4	0	4
Junior surveyor	1	0	1
Supervising architect	2	0	2
Architect	2	0	2
Total	96	45	141

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil-service appointment and engaged upon work supervised by the Bureau by whatever branch of the Government paid:

Changes	American	Filipino	Total 1924	Total 1923
Number of appointments	7	204	211	221
Number of transfers to Bureau	0	7	7	10
Number of separations for cause	0	12	12	14
Number of voluntary resignations	1	134	135	186
Number of transfers from Bureau	0	8	8	6
Number of retirement	2	3	5	2
Number of separations due to expiration of employment	0	2	2	4
Number of deaths	0	7	7	4

NOTE.—Item "Number of appointments" includes new and probational appointments.

The activities of the Bureau during 1924 and the results obtained are set forth in detail in the following tabulations and report.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1923 AND 1924

Items	Insular expenditures				Provincial and municipal expenditures		Fund from private sources		Total	
	Bureau of Public Works		Appropriation controlled by other bureaus							
	1923	1924	1923	1924	1923	1924	1923	1924	1923	1924
Roads and bridges	₱129,896.70	₱151,580.33	₱13,122.84	₱60,983.06	₱7,027,851.56	₱7,918,504.75			₱7,170,870.60	₱8,131,068.14
Telegraph, telephone, and cable lines	693,557.29	364,521.40				59,553.98			693,557.29	424,075.38
Buildings	291,237.96	81,817.59	60,817.68	321,740.05	1,272,921.84	1,882,153.38		₱6,395.41	1,624,977.48	2,292,106.43
Wireless station buildings including towers and masts	68,135.59	532.53	22,541.73	2,135.73					90,677.32	2,668.26
Maintenance, alteration, and repairs of public buildings	397,043.05	397,549.40	(296.71)	18,928.06	160,107.12	200,529.34	₱3,250.00	34.70	560,103.46	617,041.50
River and harbor work (including lighthouses and buoys and beacons)	1,061,424.59	1,580,353.40	1,426,673.76	1,588,625.80	12,447.12	28,037.24	5,516.50		2,506,061.97	3,197,016.44
Artesian wells and water supply	206,067.68	225,986.56	38,638.22	17,793.60	441,987.48	475,477.41	10,193.63	32,654.56	696,887.01	751,912.13
Irrigation projects	211,257.86	202,339.31	1,648,962.61	1,821,690.43	5,967.30	3,860.68	18,643.21	22,812.59	1,884,830.98	2,050,703.01
Benguet automobile line	80,000.00	80,000.00							80,000.00	80,000.00
Registration and regulation of motor vehicle traffic	60,000.00	50,000.00							60,000.00	50,000.00
Los Baños quarry	103,392.93	120,000.00							103,392.93	120,000.00
Operation and maintenance of central garage	30,822.46	36,000.00							30,822.46	36,000.00
Board of examiners for Engineers and Architects	1,404.03	2,000.00							1,404.03	2,000.00
Miscellaneous	8,998.10	9,000.00	152,845.51	173,489.09	152,726.95	231,640.83	5,049.92	6,197.67	319,620.48	420,327.59
Total	3,343,238.24	3,301,680.52	3,363,305.14	4,005,385.82	9,074,009.37	10,799,757.61	42,653.26	68,094.93	15,823,206.01	18,174,918.88

BALANCE SHEET, BUREAU OF PUBLIC WORKS

Assets	1923	1924
CURRENT:		
Cash, collecting and disbursing officer	₱1,404,043.15	₱1,649,469.37
Cash (deposit), Insular Treasury	(810,970.45)	(1,193,679.45)
Accounts receivable	1,929,881.93	2,311,365.46
Supplies and materials	749,790.07	701,696.20
Prepayments	1,075.69	747.13
Work in process	....	....
INVESTMENT:		
Loan to municipality of Antipolo	16,000.00	12,000.00
Total current assets	3,289,820.39	3,481,598.71
FIXED PROPERTY:		
(a) Real property and improvements	42,018,083.23	42,587,036.97
Equipment	3,498,237.38	3,502,223.98
(Less depreciation)	(925,962.26)	(837,031.99)
	47,880,178.74	48,733,827.67

Liabilities	1923	1924
CURRENT:		
Accounts payable	₱740,895.10	₱1,237,086.21
Accrued leave payable	200,613.83	210,548.60
Undistributed collections	638.93	1,646.47
Deferred credits to income	19,455.63	9,267.32
Fiduciary fund	6,054.40	18,524.30
Insurance reserve	515.02	29,869.16
CURRENT SURPLUS:		
Motor vehicle special fund, Act 3045	69,082.61	49,296.97
Wireless station buildings and towers	17,811.25	1,069.03
Construction of buildings, etc	385,105.66	185,354.76
Maintenance, alteration, and repair of public buildings	169,552.74	177,003.34
Irrigation systems	41,500.89	59,161.58
Artesian wells and waterworks	120,371.32	197,384.76
Harbor and river improvement	1,022,501.89	956,429.98
Roads and bridges	224,634.69	36,584.36
Telegraph, telephone, cables, etc	256,519.04	357,085.97
Lighthouse, buoys, and beacons	14,567.39	5,285.90
Total current liabilities	3,289,820.39	3,481,598.71
PRINCIPAL ACCOUNT SURPLUS:		
Invested in fixed property	44,590,358.35	45,252,228.96
	47,880,178.74	48,733,827.67

STATEMENT OF APPROPRIATION, INCOME, AND EXPENSES

Debit	1923	1924
Reversion of unexpended balances of administrative appropriation	₱62,636.47	₱30,007.83
Reversion of receipts	783,225.15	1,016,159.45
Operating expenditures offset by receipts	6,809,815.16	6,675,516.56
Expenditures, administrative appropriation	889,167.53	915,638.17
Outlays, purchase of equipment	3,374.68	3,617.26
Total	8,548,218.99	8,640,939.27

Credit	1923	1924
Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱955,178.68	₱945,645.00
Receipts—prime cost	6,809,815.16	6,675,516.56
Receipts—surcharges	661,829.83	807,692.23
Receipts—miscellaneous	49,713.09	121,447.51
Gain on supplies sold	1,954.12	1,659.82
Inventory adjustments	747.10	13,495.31
Income from rentals	12,191.43	13,257.58
Sales of fixed assets	5,726.90	1,807.98
Prior year's credit	51,062.68	60,416.28
Total	8,548,218.99	8,640,939.27

OPERATION STATEMENT, BUREAU OF PUBLIC WORKS

Operating revenue	1923	1924
Rental	₱12,191.43	₱13,257.58
Surcharges	661,829.83	807,692.23
Gain on goods sold	1,954.12	1,659.82
Inventory adjustments	747.10	13,495.31
Other service income	106,502.67	180,054.51
	783,225.15	1,016,159.45

Operating expenses	1923	1924
Supervising, technical, and clerical service—(salaries)	₱710,050.26	₱737,026.30
Labor	46,413.83	49,391.87
Consumption of supplies and materials	47,536.44	42,024.27
Rental of buildings	23,795.50	24,034.31
Illumination and power service	7,414.09	7,011.52
Traveling expenses of personnel	21,301.49	22,838.13
Repair service	5,937.45	5,742.38
Postal, telegraph, telephone, and cable service	10,105.26	12,290.32
Other expenses	19,987.89	18,896.33
Total operating expenses	892,542.21	919,255.43
Operating profit	(109,317.06)	96,904.02
	783,225.15	1,016,159.45

SPECIAL APPROPRIATIONS

Name of activity	Appropriations		Reversion of appropriation		Expenditures		Income	
	Act 3060	Act 3123						
	1923	1924	1923	1924	1923	1924	1923	1924
1. Registration and regulation of motor vehicles	₱60,000.00	₱50,000.00	....	....	₱60,000.00	₱50,000.00	₱628,978.54	₱633,214.36
2. Regulation and safeguarding traffic and collection of tolls	9,000.00	9,000.00	₱1.90	....	8,998.10	9,000.00	37,900.28	35,895.18
3. Benguet auto line	80,000.00	80,000.00	....	....	80,000.00	80,000.00	105,505.30	110,670.67
4. Los Baños quarry	140,000.00	120,000.00	36,607.07	....	103,392.93	120,000.00	77,456.28	75,839.85
5. Board of Examiners for Engineers and Architects	2,000.00	2,000.00	595.97	....	1,404.03	2,000.00	1,060.00	1,990.00
6. Central Garage	36,000.00	36,000.00	5,177.54	....	30,822.46	36,000.00	10,592.25	19,458.19
Totals	327,000.00	297,000.00	42,382.48	....	284,617.52	297,000.00	861,492.60	876,568.25

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNTS SURPLUS (FIXED ASSETS) DURING 1924

	1923	1924
Principal account surplus, December 31	₱43,465,612.70	₱44,586,358.35
Purchase of equipment (General Funds)	3,374.68	3,617.26
Fixed property brought into account and purchase of equipment from specific appropriations	990,684.80	1,079,233.41
Equipment acquired by transfer	190,901.56	397.82
Equipment found at station including worn-out tires taken into account	1,709.26	1,668.36
Equipment acquired by construction	....	....
Total debits	44,652,283.00	45,671,275.20

	1923	1924
Equipment sold	₱5,473.96	₱1,809.37
Equipment condemned on Insular inventory report, dropped on affidavits, undersold, etc	206,085.39	88,930.27
Fixed assets dropped on account of damages caused by earthquake	249.56	....
Equipment dropped by transfer to provinces and municipalities	13,663.19	53,231.93
Equipment and fixed assets dropped by transfer to other bureaus	31,177.36	368,008.64
Equipment issued to jobs	141.41	....
Depreciation written off	(194,866.22)	(88,930.27)
Principal account surplus, December 31	44,590,358.35	45,248,225.26
Total credit	44,652,283.00	45,671,275.20

The larger results of the year's work

Surfaced roads constructed and designated first-class	Kilometers	347.6
Reinforced concrete bridges and culverts completed	Number	30
(In this figure, concrete pipe culverts are not included)		
Successful deep wells completed	do	104
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	Number	78
Insular irrigation systems completed (irrigable area 5,500 hectares)	do	1
Waterworks projects completed (total population served 38,000)	do	9

Expenditures supervised during the year 1924 as compared with the year 1923

	1923	1924
Total expenditures	₱15,823,206.01	₱18,174,918.88
Total expended upon road and bridge work	7,170,870.60	8,131,068.14
Total expended upon building works	2,275,758.26	2,911,816.19
Total expended upon port works	2,506,061.97	3,197,016.44
Total expended upon water supply	696,887.01	751,912.13
Total expended upon irrigation projects	1,884,830.98	2,050,703.01
Operation of auto line, quarries, and the supervision of motor vehicle traffic	243,392.93	286,000.00
Expenditures on miscellaneous items account for the balance	1,045,404.26	846,402.97

ROAD WORK

Roads in existence in the various provinces of the Philippines as of December 31, 1924

Province	First-class road	Second-class road	Third-class road	Total road	Trail
	Kms.	*Kms.*	*Kms.*	*Kms.*	*Kms.*
Abra	58.2	15.9	12.2	86.3	118.1
Agusan	17.3	7.6	23.3	48.2	45.7
Albay	185.6	44.7	53.0	283.3	83.5
Antique	108.8	105.9	9.7	224.4	18.2
Baguio	44.4	.7	2.1	47.2	2.2
Bataan	37.0	18.6	2.6	58.2	74.0
Batangas	195.9	18.8	148.5	363.2	48.4
Benguet	78.6	29.5	9.8	117.9	....
Bohol	230.7	98.4	18.5	347.6	12.6
Bukidnon	....	97.0	16.7	113.7	94.5
Bulacan	116.3	138.4	63.9	318.6	....
Cagayan	72.8	76.0	27.3	176.1	153.5
Camarines Norte	25.3	15.1	10.5	50.9	3.7
Camarines Sur	148.9	20.9	64.4	234.2	52.2
Capiz	188.4	106.8	12.5	307.7	116.7
Cavite	82.4	32.9	9.7	125.0	92.6
Cebu	325.1	251.8	128.9	705.8	34.5
Cotabato	19.8	1.9	50.3	72.0	289.8
Davao	21.3	8.0	49.1	78.4	585.9
Ilocos Norte	78.4	113.7	6.7	198.8	48.1
Ilocos Sur	179.6	26.4	50.4	256.4	95.1
Iloilo	286.9	39.3	149.8	476.0	8.9
Isabela	82.1	26.0	116.0	224.1	....
Laguna	159.4	18.0	54.1	231.5	28.1
Lanao	44.3	19.7	32.1	96.1	256.8
La Union	98.6	36.8	29.1	164.5	9.5
Leyte	205.2	5.5	67.9	278.6	41.0
Marinduque	42.5	21.7	....	64.2	61.9
Masbate	38.7	3.6	13.6	55.9	....
Mindoro	21.4	50.6	22.3	94.3	270.6
Misamis	102.5	99.8	75.5	277.8	145.2
Mountain Province	....	13.0	252.9	265.9	1,012.8
Nueva Ecija	181.9	34.2	239.7	455.8	....
Nueva Vizcaya	38.7	28.6	63.6	130.9	146.7
Occidental Negros	313.4	76.7	73.3	463.4	87.4
Oriental Negros	151.7	19.1	76.1	246.9	177.4
Pampanga	201.1	60.0	96.8	357.9	....
Pangasinan	440.0	43.1	192.6	675.7	....
Rizal	180.9	16.7	26.2	223.8	16.6
Romblon	....	26.5	15.2	41.7	260.6
Samar	107.5	50.9	99.3	257.7	39.1
Sorsogon	93.0	59.5	28.0	180.5	....
Sulu	18.3	22.8	15.6	56.7	94.8
Surigao	53.6	2.0	5.4	61.0	15.0
Tarlac	134.8	8.2	44.7	187.7	27.6
Tayabas	165.8	40.5	62.1	268.4	....
Zambales	49.3	33.2	38.7	121.2	23.4
Zamboanga	61.9	38.0	43.9	143.8	115.5
Total	5,488.3	2,123.0	2,704.6	10,315.9	4,808.2

DEFINITIONS FOR ROAD CLASSIFICATION

First-class roads.—Well-graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing two tons or more. These roads are continuously passable at all times, with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing

	December 31, 1923	December 31, 1924
	Kilometers	*Kilometers*
Stone	1,507.1	1,535.1
Gravel	3,398.3	3,536.3
Coral	1,671.4	1,760.8
Unsurfaced	3,555.8	3,483.7
Total	10,132.6	10,315.9

BRIDGES

Durable bridges and culverts in existence

Fiscal year ending—	All durable structures	
	Total number	Increase during the year
June—		
1910	4,372	507
1911	4,842	470
1912	5,177	358
1913	5,654	508
December—		
1913 (6 months)	5,901	190
1914	6,206	305
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	56
1919	7,491	65
1920	7,521	30
1921	7,481	[a] 40
1922	7,562	81
1923	7,586	24
1924	7,613	27

[a] Decrease.

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick, and all substantial stone structures whether of adobe or other material. The increase of 27 structures includes those actually completed during the year as well as those which should have been previously reported minus structures reported missing for the first time. The above figures are obtained from semiannual reports of district engineers.

Reinforced concrete structures in existence

Fiscal year ending—	Total number	Total meters
June—		
1910	[a]	[a]
1911	2,004	7,709
1912	2,350	9,216
1913	2,854	11,224
December—		
1913 (6 months)	3,046	11,984
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280
1922	4,366	17,684
1923	4,400	18,045
1924	4,428	18,413

[a] No data.

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other classes of construction.

ARTESIAN WELLS

During the year 1924 there were, on the average, twenty-two (22) deep well rigs in the field, nineteen (19) of which were in active operation throughout the year. The average number of machines in operation for the year, not including those engaged in drilling private wells and those that were laid up, was 17½ per month against 8¹¹⁄₁₂ for last year. The principal factor making it possible to operate a greater number of machines during 1924 was the fact that at the beginning of the year there was a credit balance of about ₱113,000 from the 1923 Insular appropriations which enabled the

Bureau to continue drilling operation until the 1924 appropriations were released in June, 1924.

The total number of successful wells drilled by the Bureau from 1904 to 1924 is 1,647. This number includes private wells drilled from 1904 to 1923. These wells are capable of supplying a total of 40,406,000 gallons of potable water per 12-hour day which at the rate of 20 gallons per person per day of 12 hours, would supply no less than 2,020,290 people.

Funds expended

	1924		1923	
	Pesos	Per cent	Pesos	Per cent
Successful wells	224,320.69	86	167,112.72	84
Unsuccessful wells	37,659.07	14	32,456.70	16
Total	261,979.76	100	199,569.42	100

Deep Well Pump No. 1 with new sanitary improvements installed at Plaza Miranda, Quiapo, Manila

Comparative cost of drilling

(*a*) UNSUCCESSFUL WELLS INCLUDED

	1924	1923	+ Increase or — decrease
Per meter	₱26.65	₱29.17	—₱2.52
Per foot	8.25	8.89	— .64

(*b*) UNSUCCESSFUL WELLS NOT INCLUDED

	1924	1923	+ Increase or — decrease
Per meter	₱25.60	₱32.38	—₱6.78
Per foot	8.16	9.87	— 1.71

Summary of deep well drilling, 1924

[Not including private wells]

	Number of wells drilled	Total depth in meters	Total flow in liters per minute
Successful—			
Flowing	36	3,953	6,572
Pumping	68	4,430	7,095
Total successful	104	8,383	13,667
Total unsuccessful	17	1,298	....
Grand total	121	9,681	13,667

The former practice of drilling artesian wells for private parties, when equipment is available, has been discontinued, and all private wells drilled by Bureau outfits last year were on a rental basis of ₱18 per day or fraction thereof. The private party assumes all the responsibility as to the cost and supervision of drilling operations. Under this new arrangement nine wells were drilled, one for the Royal Ice Plant, San Miguel Brewery, Manila, one for the Hawaiian-Philippine Central at Silay, Occidental Negros, one for the Hospital Español de Santiago, Makati, Rizal, and six for the Mindoro Sugar Company, San Jose, Mindoro. These nine wells were drilled to an aggregate depth of 2,733 feet. All of these wells except one of the two which were drilled at Naujan for the Mindoro Sugar Company have been declared successful.

Miscellaneous work was performed by drilling crews and the Machine Shop, consisting of repairing and cleaning 28 artesian wells in the City of Manila and 17 wells scattered throughout the provinces.

Percentage of unsuccessful wells drilled (not including private wells)—1924, 14; 1923, 14.

Out of the total of seventeen unsuccessful wells drilled during 1924, only two were abandoned due to loss of tools, the rest were successfully completed, but the water obtainable was either salty or not suitable for drinking or for domestic purposes.

Drilling machines operated by Bureau of Public Works

[Total, 31 machines]

	In field	Stored at Pipe Bodega and Property Division
Cyclone (belonging to the Province of Bulacan)	1	....
Keystone (operated by Los Baños Quarry)	1	....
Star	3	1
Columbia No. 5	4	3
Columbia No. 3	11	3
Columbia No. 10	....	3
Standard	....	1
Total machines	20	11

BUREAU OF PUBLIC WORKS MACHINE SHOPS

The B.P.W. Machine Shop which was formerly located at 500 Reina Regente was transferred during the early part of the year to 817 Muelle de la Industria, and it is estimated that this will result in an annual saving of approximately ₱7,800. This transfer caused considerable delay in accomplishing certain work while equipment was being transferred. Notwithstanding this interruption, there were completed during the year 894 work orders which were received from various Government bureaus and offices, involving a total sum of ₱88,798.18, as compared with 939 work orders completed during the same period in 1923, involving a total sum of ₱76,987.24. These figures show a decrease of 45 work orders accomplished during 1924 but the amount of income shows an increase of ₱11,810.94 over that of the previous year. The Machine Shop personnel performed overtime work equivalent to 135 working days.

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year ending December 31, 1924, there were 3,005 motor vehicles newly registered and 12,671 reregistered for operations, or a total of 15,676 motor vehicles, as compared with 13,689 registered during 1923. There were also 1,018 motor vehicles registered for storage. During this same period, about 5,550 applicants for drivers' licenses were examined and 3,141 new licenses issued. Including renewals, 22,632 operators of motor vehicles were licensed during 1924.

The results of the campaign conducted during the year for the apprehension of violators of the Motor Vehicle Law are as follows:

Year 1924	Total number of cases reported	Cases for reckless driving		Cases for speeding	
		Number	*Per cent*	*Number*	*Per cent*
First quarter	105	38	36	14	13
Second quarter	253	33	13	20	8
Third quarter	273	37	31	29	11
Fourth quarter	210	61	29	17	8
Total	841	169	....	80	....

Provisions of the Automobile Law most commonly violated

Act No. 3045:	
Section 20—overloading	294
Section 26 (*b*)—reckless driving	189
Section 34—lights	139

Provisions of the Automobile Law most commonly violated—Ctd.

Act No. 3045—Continued.	
Section 14 (*h*)—driving without license	137
Section 26 (*a*)—speeding	87
Number of deaths reported during the year	30
Number of licenses suspended during the year	303
Number of licenses revoked during the year	6
Amount of fines reported imposed during the year	₱22,613

COLLECTION AND EXPENDITURES

The following tabulation shows the yearly amount of funds collected and expended for the registration and regulation of motor vehicles from 1912 to 1924.

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,392.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	[a]628,918.54	60,000.00
1924	633,214.36	50,000.00

[a] This amount includes the ₱73,551.81 collected in 1922 by the City Treasurer for the additional registration fees of motor vehicles operating in the City of Manila.

BENGUET AUTOMOBILE LINE

The Benguet Automobile Line operated during the year, 5 first-class busses, 1 third-class bus, 1 combined passenger and express truck, 1 fire truck, 4 express and freight trucks, 10 special touring cars, 1 jitney for baggage delivery, and 1 service car for mechanics, and handled during the same period, 4,066 and 184 half rate first-class passengers, 5,442 and 1,020 half rate third-class passengers, 163,720 kilos of hand baggage, 1,437,359 kilos of express and freight, and 105,593 kilos of dead head express and freight.

The total income for 1924 amounted to ₱110,670.67 as compared with ₱105,505.30 for 1923. The operating expenses were ₱79,976.86 which means that a net profit of ₱30,693.81 was realized.

THE USE OF THE KENNON AND NAGUILIAN ROADS

These two roads leading from the lowlands to Baguio have been maintained in good condition and at a very reasonable cost. Traffic over these roads was interrupted for a matter of a few days only during two heavy typhoons.

A comparative statement of traffic over these two roads during the past three years is given hereunder:

Summary of traffic over the Kennon and Naguilian Roads

KENNON ROAD

Year	Pedestrians	Bull-carts	Animals led or ridden	Calesas	Motor-cycles	Automobiles (passenger)	Automobiles (Trucks)	Wagons
1922	18,385	11,726	390	2	410	4,403	2,422	38
1923	14,767	9,077	300		351	4,795	3,170	100
1924	12,173	2,924	198		1,150	6,137	4,398	48

NAGUILIAN ROAD

Year	Pedestrians	Bull-carts	Animals led or ridden	Calesas	Motor-cycles	Automobiles (passenger)	Automobiles (Trucks)	Wagons
1922	20,051	13,568	1,792	29	115	4,067	6,172	1,430
1923	22,090	11,318	1,332	16	193	4,552	7,358	754
1924	23,136	8,538	676	13	112	4,455	8,436	315

It will be noted that the number of bull-carts using the Kennon Road has been considerably reduced on account of quarantine of animals beginning the latter part of 1923.

GOVERNMENT CENTRAL GARAGE

The Central Garage which was established in order to provide the Government bureaus and offices with an economical day and night automobile service, operates the following cars:

Ford, 4; Dodge, 3; Chandler, 2; and Renault, 1.

During the year ending December 31, 1924, thirty (30) different bureaus and offices of the Insular Government, including the Benguet Auto Line and the City of Manila, made calls for transportation. The following tabulation shows a comparison of the total number of calls received by the Central Garage:

	1923	1924	Percentage of increase
			Per cent.
Transportation within the City	2,183	2,677	20
Provincial trips	104	210	100

The schedule of rates, revised on June 21, 1924, lowered the charges for the city service and increased the provincial rates. The following tabulation shows the income and the amount expended for the operation of the Central Garage:

Year	Income	Expenditures
1923	₱10,592.45	₱30,822.46
1924	19,458.19	36,000.00

The total income of the Central Garage would have been larger were it not for the fact that the Bureau of Agriculture was furnished a Dodge, free of charge, for the Anthrax Campaign from July to December. This service would have cost them about ₱6,000.

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Chief Constructing Engineer*

ROADS

The maintenance of existing roads with the limited funds available continued to be the most important problem confronting the Constructing Division. It may be safely stated that, from the standpoint of a sound road policy, nearly all provinces are not in a position financially to construct new roads, in view of the fact that their present road and bridge revenues are hardly sufficient, if not completely inadequate, to meet the bare needs of maintaining existing roads.

Hereunder are tables Nos. "1–A," "1–B," and "1–C" showing the cost of road maintenance since 1911.

TABLE NO. 1–A.—*Costs of maintenance of first-class roads*

Year	Average cost per kilometer maintained	Average length in kilometers maintained thruout the year	Total cost of maintenance
June 30—			
1911	₱492.02	1,441.7	₱709,369.72
1912	463.20	1,785.3	826,972.11
1913	555.00	1,976.3	1,096,854.29
December 31—			
1913 (6 months only)	251.39	2,146.3	539,560.88
1914	479.91	2,288.1	1,098,082.54
1915	475.91	2,643.6	1,258,114.15
1916	516.89	3,177.5	1,642,404.93
1917	607.42	3,529.5	2,143,887.68
1918	717,79	3,840.7	2,756,810.70
1919	765.71	4,209.3	3,223,119.18
1920	700.96	4,561.2	3,197,202.28
1921	793.82	4,739.4	3,762,218.99
1922	866.27	4,854.5	4,205,289.25
1923	871.06	5,014.3	4,367,742.20
1924	855.75	5,213.0	4,461,035.06

TABLE NO. 1–B.—*Second-class and third-class roads*

Year	Average cost per kilometer maintained	Average length in kilometers maintained thruout the year	Total cost of maintenance
June 30—			
1911	₱112.87	2,160.0	₱243,805.39
1912	143.10	2,339.0	334,706.84
1913	127.53	2,376.0	302,974.25
December 31—			
1913 (6 months only)	100.45	1,721.7	172,953.50
1914	164.82	2,418.8	398,655.30
1915	147.44	2,692.2	396,930.57
1916	168.51	2,800.4	472,129.17
1917	183.27	3,057.0	560,258.92
1918	212.53	2,773.5	589,450.32
1919	220.92	3,152.5	696,440.38
1920	245.98	3,030.1	745,351.19
1921	233.14	3,200.3	746,102.24
1922	239.74	3,389.4	812,581.92
1923	270.23	3,535.6	955,440.81
1924	267.83	3,840.3	1,028,547.73

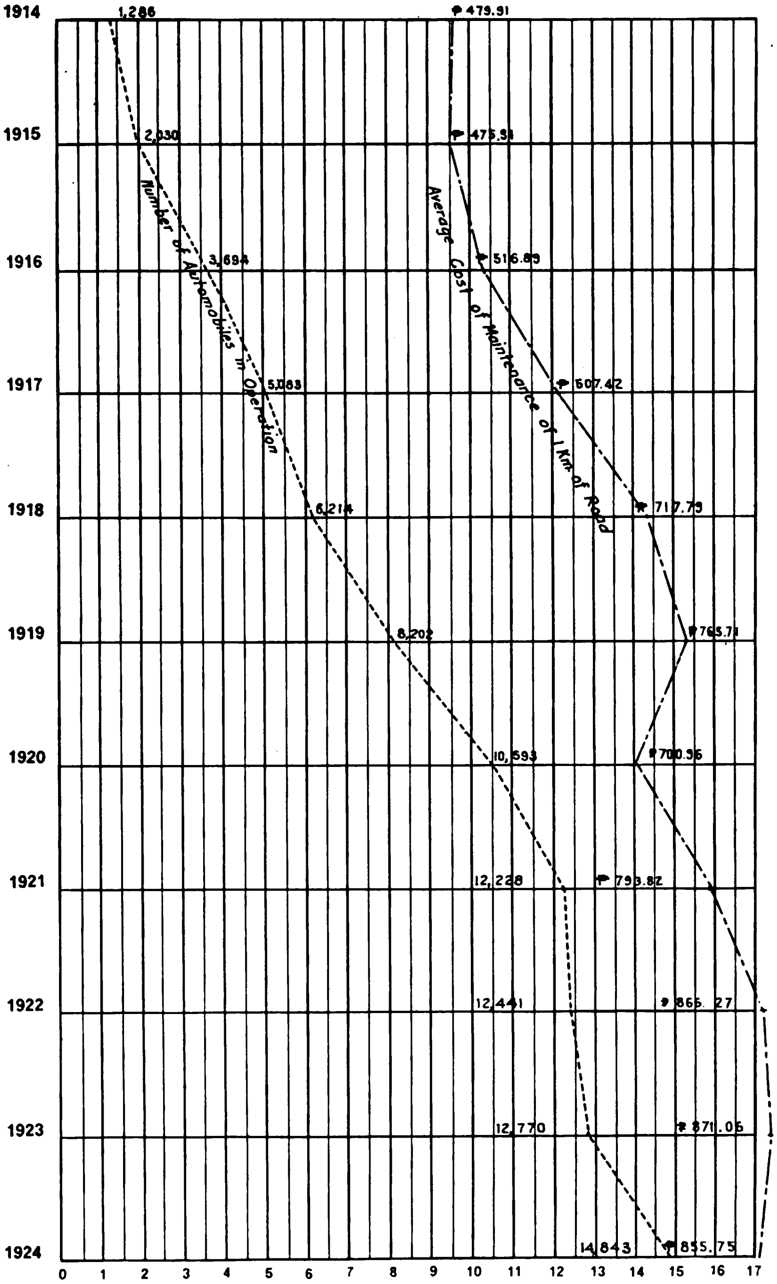
TABLE No. 1–C.—*Total cost of road maintenance*

Year	First-class roads	Second-class roads	Total
1915	₱1,258,114.00	₱396,931.00	₱1,655,045.00
1916	1,642,404.00	472,129.00	2,114,533.00
1917	2,143,888.00	560,259.00	2,704,147.00
1918	2,756,811.00	589,450.00	3,346,261.00
1919	3,223,119.00	696,440.00	3,919,559.00
1920	3,197,202.00	745,351.00	3,942,553.00
1921	3,762,219.00	746,102.00	4,508,321.00
1922	4,205,289.00	812,582.00	5,017,871.00
1923	4,387,742.00	955,441.00	5,323,182.00
1924	4,461,035.00	1,028,548.00	5,489,583.00

GRAPHICAL SHEET No. 1

FIRST-CLASS ROADS ONLY

Number of motor vehicles; Scale 1 cm. = 1,000 motor vehicles.
Average cost of road maintenance per kilometer per year; Scale 1 cm. = ₱50.



From the foregoing tables it is apparent that the average cost per year for maintaining a kilometer of road has been steadily increasing since 1916. This increase is attributed to the constant rise in the price of labor and material, to the increasing kilometerage of old roads requiring extensive repairs or reconstruction, as well as to the increasing number of motor vehicles the registration of which increased from 1,286 in 1914 to 14,843 in 1924. This increase in the number of motor vehicles is shown by the following table No. 2, and the corresponding increase in the average cost of road maintenance is shown on graphical sheet No. 1.

The slight decrease shown during 1924 in the average cost per kilometer of road maintained as compared with the same figures for 1923 is probably due to the fact that for the past three years the efforts of the Constructing Division were largely centered on the maintenance and reconstruction of first-class roads. The work of the previous three years had, undoubtedly, put our existing first-class road system into such a good condition that less money was needed to maintain a kilometer of road notwithstanding the increase in traffic.

TABLE No. 2.—*Number of motor vehicles in operation in the Philippine Islands*

Year	Automobiles	Trucks	Total
1914	1,046	240	1,286
1915	1,727	303	2,030
1916	3,295	399	3,694
1917	9,524	559	5,083
1918	5,445	769	6,214
1919	6,892	1,310	8,202
1920	8,318	2,275	10,593
1921	9,481	2,747	12,228
1922	9,537	2,904	12,441
1923	9,662	3,118	12,770
1924	10,973	3,870	14,843

While road maintenance cost has been increasing at the rate of ₱600,000 per annum, the provincial road and bridge revenues have remained practically stationary. This is clearly shown by the following table No. 3 and graphical sheet No. 2 (page 13).

TABLE No. 3.—*Provincial road and bridge funds*

Year	Cedula tax	Real property tax	Internal revenue allotment	Total
1916	₱2,090,808	₱637,831	₱739,354	₱3,467,993
1917	2,559,421	687,317	721,681	3,958,419
1918	2,381,084	724,493	718,500	3,824,077
1919	2,244,404	795,588	769,375	3,809,367
1920	2,395,749	934,586	769,375	4,099,710
1921	2,176,353	1,125,903	769,375	4,071,631
1922	2,299,018	1,401,162	769,375	4,469,555
1923 [a]	2,135,802	1,094,579	769,375	3,999,756
1924 [a]	2,249,309	1,208,194	769,375	4,326,878

[a] The figures for 1923 and 1924 were taken from the Provincial Road and Bridge budget and represent the estimate of the Provincial Treasurer and not the actual collections. The figures from 1916 to 1923 are actual collections taken from the Insular Auditor's annual reports.

In order to provide sufficient funds for road maintenance in many provinces it has been necessary not only to insist upon all regular allotments from Insular funds being employed for maintenance work, but also to grant special allotments from the receipts from the registration of motor vehicles for this purpose.

The road construction policy established during previous years of utilizing any available funds for the construction of new roads, *after the necessary funds for maintenance purposes were set aside*, was strictly adhered to. As to the projects undertaken, preference has been given to the completion of the more important roads which have been under construction for a number of years, and to connecting up isolated sections of roads in such a way as to make same of greater service to the public with the final objective of developing a network of roads throughout the Archipelago conducive to the greatest economic development of the country.

The total number of kilometers of first-class roads on December 31, 1924, was 5,488.3 as compared with 5,140.7 kilometers of first-class roads on December 31, 1923. This means an increase during 1924 of 347.6 kilometers as shown in detail hereunder:

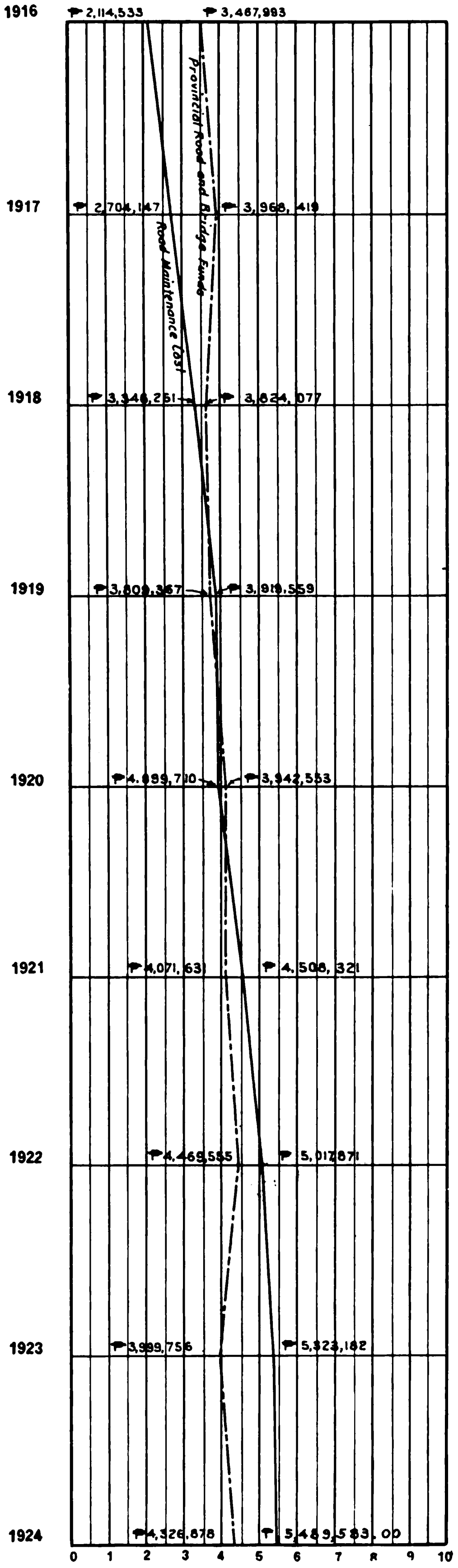
Increase in first-class road kilometerage during the year 1924

Province	Roads in existence December 31, 1923	Roads in existence December 31, 1924	Increase during the year 1924
	Kms.	*Kms.*	*Kms.*
Abra	54.3	58.2	3.9
Agusan	17.3	17.3	0.0
Albay	184.0	185.6	1.6
Antique	104.4	108.8	4.4
City of Baguio	43.2	44.4	1.2
Bataan	36.8	37.0	.2
Batangas	187.4	195.9	8.5
Benguet	75.3	78.6	3.3
Bohol	220.0	230.7	10.7
Bukidnon			0.0
Bulacan	116.3	116.3	0.0
Cagayan	68.6	72.8	4.2
Camarines Norte	24.5	25.3	.8
Camarines Sur	137.6	148.9	11.3
Capiz	188.6	188.4	(less) .2
Cavite	81.0	82.4	1.4
Cebu	308.5	325.1	16.6
Cotabato	15.1	19.8	4.7
Davao	18.3	21.3	3.0
Ilocos Norte	78.4	78.4	0.0
Ilocos Sur	174.0	179.6	5.6
Iloilo	268.5	286.9	18.4
Isabela	81.2	82.1	.9
Laguna	153.6	159.4	5.8
Lanao	42.9	44.3	1.4
La Union	90.5	98.6	8.1
Leyte	120.1	205.2	85.1
Marinduque	42.5	42.5	0.0
Masbate	36.9	38.7	1.8
Mindoro	19.0	21.4	2.4
Misamis	103.5	102.5	(less) 1.0
Mountain Province			0.0
Nueva Ecija	167.9	181.9	14.0
Nueva Vizcaya	37.7	38.7	1.0
Occidental Negros	298.3	313.4	15.1
Oriental Negros	147.1	151.7	4.6
Pampanga	201.1	201.1	0.0
Pangasinan	364.1	440.0	75.9
Rizal	176.9	180.9	4.0
Romblon			0.0
Samar	103.4	107.5	4.1
Sorsogon	93.0	93.0	0.0
Sulu	20.3	18.3	(less) 2.0
Surigao	53.6	53.6	0.0
Tarlac	117.9	134.8	16.9
Tayabas	161.4	165.8	4.4
Zambales	43.8	49.3	5.5
Zamboanga	61.9	61.9	0.0
Total	5,140.7	5,488.3	347.6

GRAPHICAL SHEET No. 2

Diagram showing annual provincial road and bridge funds and maintenance costs

Scale 1 cm. = 1,000,000 pesos



Among the most important road construction projects undertaken during the year, the following may be mentioned:

Construction of Rosario–Bolbok Road. (Batangas Province.) This road is twenty-two (22) kilometers long. In previous years, eleven and three-tenths (11.3) kilometers had been completed. This year four (4) more kilometers were finished. This road is the missing link in the road to connect Batangas and Tayabas provinces via Candelaria and it is expected to open it to traffic during 1925.

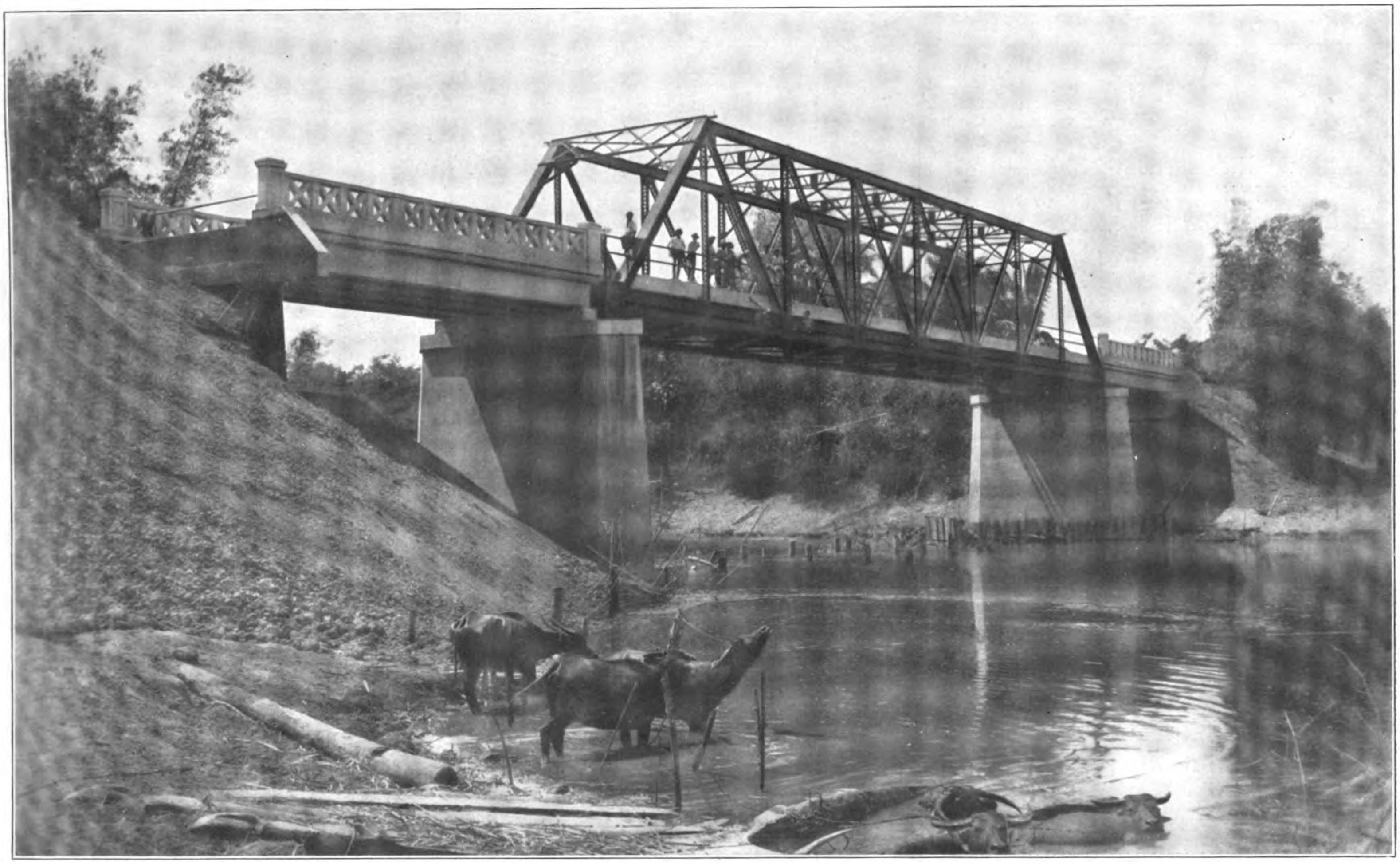
Construction of Damortis–Agoo Road. (La Union Province.) This road is ten and six-tenths (10.6) kilometers long. The work thereon was started on November 6, 1924, and will be finished on or before Aprii 30, 1925. Forty thousand pesos (₱40,000) have been appropriated for this project and this amount is considered sufficient to complete it (bridges excluded). The road will be of great importance to the Province of La Union, Ilocos Sur, Abra, and Ilocos Norte, as it will shorten the distance between the Ilocano provinces and the City of Manila by sixty (60) kilometers.

Construction of San Jose–Santa Fe Road. (Nueva Ecija and Nueva Vizcaya Provinces.) This road is a section of the Cagayan Valley Road which will connect the rich Provinces of Cagayan, Isabela, and Nueva Vizcaya, with the provinces of Central Luzon and Manila. The length of this project is 58 kilometers, 51 kilometers of which are in Nueva Ecija and the remaining 7 kilometers lie in the Province of Nueva Vizcaya.

The total expenditure on this project during 1924 was ₱114,740.67 and the total percentage of work completed on December 31, 1924, was 53 per cent.

While this road has been kept open for traffic during the past, excepting short periods during typhoons, its completion as a first-class road will depend upon the funds that can be made available for construction purposes.

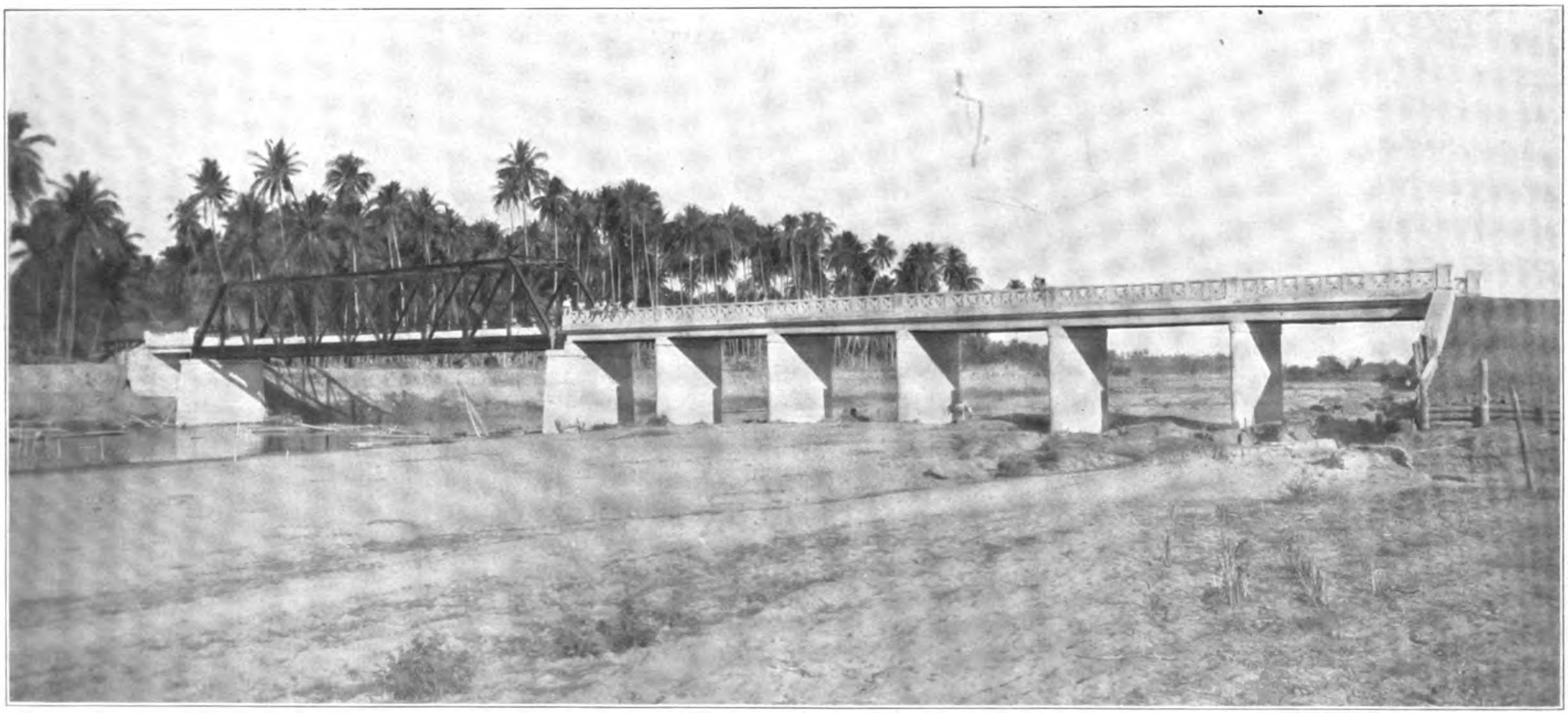
Construction of Bayombong–San Luis Road. (Nueva Vizcaya Province.) This project is also a section of the Cagayan Valley Road, 46.3 kilometers long. This road connects the Provinces of Nueva Vizcaya and Isabela, and facilitates the exportation of rice from Nueva Vizcaya to Isabela and Cagayan where only a small amount of rice is produced. The total expenditure on this project during 1924 was ₱28,908.70, and the total percentage of work completed to December



San Juan Bridge, Pangasinan

31, 1924, was 83 per cent. While this road has been open for traffic for a number of years, it is expected to complete the entire section as a first-class road during 1925.

Construction of Fabrica–Sagay–Escalante Road. (Province of Occidental Negros.) The section between Fabrica and Sagay was completed and declared as first-class road during the year. With



Mangaldan Bridge, Pangasinan

Matandangasan Bridge, Boac-Gasan Road, Marinduque

the completion of this section of the road, the hitherto isolatad town of Sagay has been connected with the rest of the province.

The section of the road between the municipalities of Sagay and Escalante which is 26.5 kilometers long is still under construction. About 99 per cent of the subgrade has been completed, and approximately 90 per cent of the first course gravel delivered. To date, 82 per cent of the work contemplated thereon has been accomplished. The completion of this project depends upon the appropriation to be made from provincial funds.

Construction of Sorsogon-Albay Road. (Sorsogon Province.) This road which connects the Provinces of Sorsogon and Albay is 62.33 kilometers long; 20.42 kilometers on the Albay side, and 41.91 kilometers on the Sorsogon side. The portion of the road under construction is 27.65 kilometers, the rest, 34.68 kilometers, having been completed in previous years. The completion of this interprovincial road will not only enhance the development of the agricultural lands traversed by same in the Provinces of Sorsogon and Albay, but will also facilitate the transportation of agricultural products to the ports of these provinces.

BRIDGES

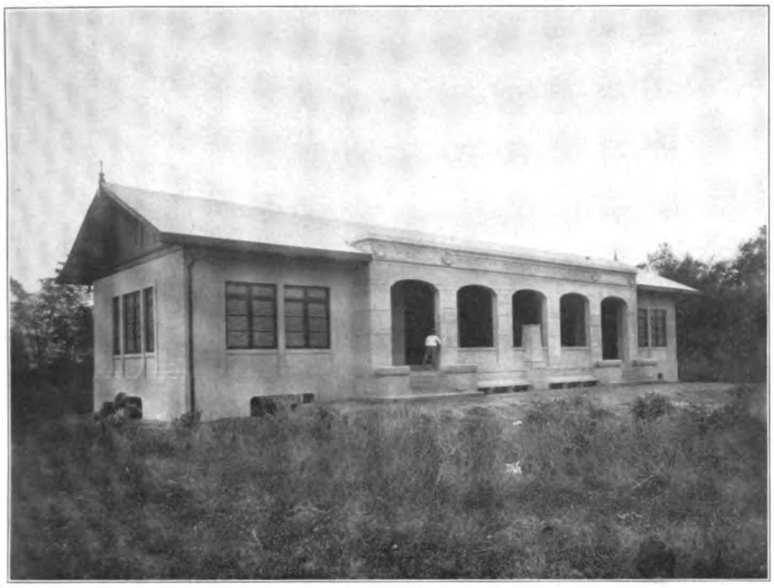
A tabulated description of the bridges, fully or partly completed during the year 1924, is given below.

The following are some of the more important bridges constructed or under construction during the year:

Tampugo Bridge. (Ilocos Sur Province.) This bridge is located on kilometer 364 on the Manila–North Road between the municipal-

Important permanent bridges partially or completely constructed during the year 1924

Province	Name	Bridge and km. No.—	Type	Span in meters and feet	Roadway in feet and meters	Percentage of work completed	Total and partial cost
Ilocos Sur	Tampugo	363.83	Reinforced concrete deck girder	2-8.0 m.	4.88 m.	100	₱8,211.13
Marinduque	Matandangasan	16.97	do.	2-12.0 m.	4.88 m.	100	24,952.57
Mountain Province	Irisan		Steel truss with wooden floor	61′-3″	10′-0″	100	8,000.00
Do.	Bued River		2-Hinged steel Brace Arch	130′-0″	10′-0″	100	15,000.00
Pampanga	Angeles	89.0	Reinforced concrete deck girder with side walk.	1-11.0 m.	4.88 m.	100	15,782.99
Pangasinan: San Carlos-Urbiztondo Road	San Juan	233.29	Through riveted steel and reinforced concrete deck girder.	1-130′-0″ and 2-12.0 m.	4.88 m.	100	60,517.57
Pangasinan: Pao-Lingayen Road	Mangaldan	233.49	do.	1-160′-0″ and 7-9.0 m.	4.88 m.	95	85,161.96
Pangasinan: Rosales-Nueva Vizcaya Road	Bitang	223.38	Reinforced concrete deck girder	2-7.0 m.	4.88 m.	8	18,647.67
	Iris	22.67	do.	1-9.0 m.	4.88 m.		
Samar	Borongan	23.0	do.	1-12.0 m.	4.88 m.	50	58,086.64
Sorsogon	Sagorong	20.20	do.	3 8.0 m.	4.88 m.	97	16,849.43
Tayabas	Kalilayan	0.9	U-Abutments and pile bents	3-9.0 m.	4.88 m.	50	26,552.62
Total							337,762.58



Del Pilar Memorial School, Bulacan

Laoag Normal School, Ilocos Norte

ities of Tagudin and Santa Cruz, Province of Ilocos Sur. This bridge consists of two 8-meter (2–8 m.) reinforced concrete slab and girder spans on concrete pile bents.

The work on this structure was advertised, but as there were no bids received, same was done by administration. The estimated cost was ₱9,300 and the work was completed for ₱8,211.13.

Matandangasan Bridge. (Marinduque Province.) This bridge is a standard reinforced concrete deck girder and slab type, consisting of two 12-meter (2–12 m.) spans, with a 4.88 meters clear roadway, supported by two reinforced concrete "U" abutments and one concrete pier. It is located on the Boac–Buenavista Road. Its completion is a great benefit to the inhabitants of the municipalities of Gasan and Buenavista. During floods, the Matandangasan River cannot be crossed for a period of several days on account of the velocity of the current.

San Juan Bridge. (Pangasinan Province.) This bridge is located approximately two (2) kilometers from the town of San Carlos and spans the San Juan River on the San Carlos–Urbiztondo Road. The structure consists of one through riveted steel truss, one hundred and thirty feet long (130′–0″), and two 12-meter (2–12 m.) reinforced concrete slab and girder approach spans. Both the concrete and steel spans are set on two reinforced open abutments and two plain piers with wooden piles for foundation. This project was let by contract to Mr. Feliciano Nable for ₱55,880 and work thereon was started in January, 1924, and completed on September 11th of the same year. The total cost, including Insular and provincial surcharges and other incidental expenses, was ₱60,373.43.

Provincial Hospital, Bacolod, Occidental Negros

Mangaldan Bridge. (Pangasinan Province.) The Mangaldan Bridge over the Angalacan River on the Pao–Lingayen Road consists of a one hundred and eighty-foot (180′) through riveted steel truss with reinforced concrete floor supported by concrete piers on timber pile foundation, of one 9-meter (1–9 m.) reinforced concrete slab and girder approach on the west end (Mangaldan side) and six 9-meter (6–9 m.) reinforced concrete slab and girder approach on the east end (San Jacinto side), both approaches being supported by reinforced concrete pile bents. The concrete work and the erection of the steel truss were let by contract to Mr. Sotero Baluyot for ₱57,000, and the manufacture of the steel truss was also let by contract to the Atlantic, Gulf and Pacific Company for ₱20,777, making a total of ₱77,777. The total cost of the structure, including Insular and provincial surcharges and other incidental expenses was ₱85,053.28.

Iris and Bitong Bridges. (Pangasinan Province.) The contract for the construction of these two concrete bridges on concrete pile bents with one 9-meter and two 7-meter spans (1–9 m. and 2–7 m.), respectively, over the Iris and Bitong Creeks on the Rosales–Nueva Vizcaya Road was let to Mr. Juan Ferrer on September 8, 1924, for the lump sum of ₱17,350, the projects to be completed within one hundred and forty (140) days. The work thereon is not progressing as rapidly as expected on account of the hard substratum encountered, but same can be overcome without much difficulty.

Borongan Bridge. (Samar Province.) This bridge over the Borongan River on kilometer 2.3 of the Borongan North Road is under construction. It will be of reinforced concrete, deck girder and slab type, and consists of seven 12-meter spans (7–12 m.) set on reinforced concrete pile bents, with a roadway of four meters and eighty-eight centimeters (4.88 m.). The work is being done by contractor Agustin Jereza of Cebu, and the contract price is ₱50,000.

Sagorong Bridge. (Sorsogon Province.) This bridge spans the Sagorong River on the Sorsogon South Road. It consists of three 8-meter (3–8 m.) reinforced concrete slab and girder spans, supported by reinforced concrete pile bents. The work was done by administration at a cost of ₱16,849.43, which is ₱2,475.57 less than the lowest bid.

Kalilayan Bridge. (Tayabas Province.) This structure is located on the Panaon–Unisan Road over the Kalilayan River. It consists of three 9-meter (3–9 m.) standard reinforced concrete slab and girder spans, supported by two (2) reinforced concrete "U" abutments and two (2) reinforced concrete pile bents. The contract for this project was let to Mr. Francisco Lee of Lucena for the sum of ₱23,800.

Provincial Capitol Building, Dumaguete, Oriental Negros

MISCELLANEOUS BRIDGES

The following is a tabulated description of miscellaneous bridges fully or partly completed during the year 1924.

Miscellaneous bridges partially or completely finished during the year 1924

Provinces	This year's expenditure	Remarks
Abra	₱149.31	Temporary structures.
Bulacan	1,132.72 3,033.57	Repair Santiago Bridge.
Benguet (Subprovince)	8,102.78	Miscellaneous bridges.
Bataan	11,060.79	Temporary structures.
Camarines Norte	599.42	Miscellaneous bridges.
Camarines Sur	2,603.67	Do.
Davao	423.76	Do.
Ilocos Norte	244.49	Do.
Marinduque	383.13	Do.
Misamis	2,103.84	Reconstruction, Ganoan Bridge.
Occidental Negros	10,200.27	Collapsible bridge.
	122.00	Miscellaneous bridges.
Rizal	3,960.68	Mariquina collapsible bridge.
Sorsogon	3,868.16	
Total	47,988.59	

BUILDINGS

Manila.—The Legislative (Insular) building continued to be the sole large project of this nature handled during the year. Contract was awarded on bids opened March 19 for the completion of the structure, less electrical work, to the Mas Construction Company, of Manila, for ₱1,872,000. Owing to the vast amount of detail work required to prepare new electrical plans for the revised design of the building, it was necessary to execute the conduit work by administration, in order that the contractor might not be delayed. Very good progress has been made during the year and the entire project was 55 per cent completed at the end of December. Expenditures for the year amounted to approximately ₱200,000.

The temporary building to house the University High School, University of the Philippines, was completed under contract, by the Mas Construction Company. This structure is a 2-story wood-framed building with galvanized iron roof. The total floor area is 740 square meters at a total cost, including electrical work and all other charges, of ₱37,000.

Contract was let to Mr. Feliciano Nable for the construction of a new fire-proof property bodega for the Philippine General Hospital and work was begun late in the year. This is to be a one-story structure of reinforced concrete throughout, with steel window sash, glazed with wire glass. It is to be 73.40 meters long by 8.60 meters wide. Included in this contract is the erection of a small building to house the new sterilizing apparatus of the Hospital. This is a wood-framed building, sheathed with galvanized iron. The cost of the two buildings will be approximately ₱52,000.

The North Wing of the new Chemical Laboratory for the University of the Philippines was completed and occupied early in the year, at a cost of ₱23,200. The work was done by Mr. Romarico Agcaoili, by contract.

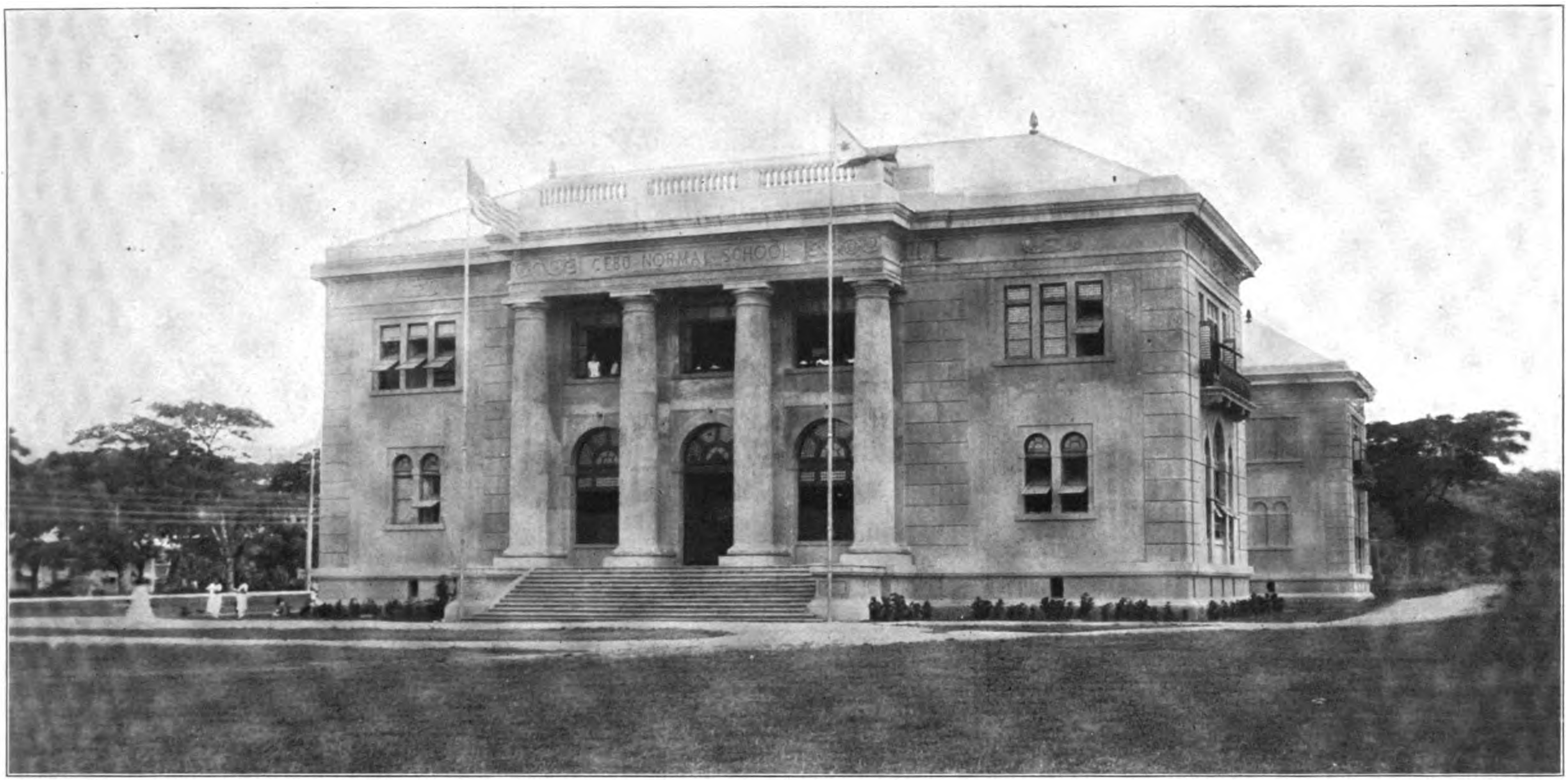
Provinces.—Following is a description of the most important public buildings constructed in the provinces during 1924.

Del Pilar Memorial School Building. (San Nicolas, Bulacan.) This is a concrete, one-story school building patterned after the Standard Plan No. 4, but with an improved façade adorned at the center with a bust of the Filipino patriot, Marcelo H. del Pilar. The building is constructed on the site where Del Pilar is supposed to have been born and lived for a long time during the troublous Spanish régime. It was completed at a total cost of ₱21,805.47.

Cebu Normal School Building. (Province of Cebu.) This building has the following principal dimensions: front wing, 29.90 meters by 11.60 meters; main hall, 37.06 meters by 11.60 meters; rear wing, the same as the front wing. It is a 2-story structure. In the first floor there are 5 class, 2 office, 1 lecture, and 1 laboratory rooms. In the second floor there are 8 class, 1 laboratory, and 1 library rooms. Actual construction was started on February 26, 1922, and the building proper was completed on December 15, 1923, at a total cost of, including electrical lighting installations, ₱299,643.73. The building was turned over to the Director of Education on April 21, 1924, and was occupied on June 9, 1924.

Asturias School Building. (Province of Cebu.) This building is of the new type, Bureau of Education Plan No. 9, measuring 45.40 meters by 21.20 meters. The construction work was completed partly by administration and partly by contract at a total cost of ₱47,077.67.

Davao Public Market Building. (Province of Davao.) This is a Standard Plan Type "A" building, measuring 24 meters wide by 39.10 meters long. It is constructed midway between Davao and



Normal School Building, Cebu

Santa Ana. The construction work was started during the early part of July and completed on December 20, 1924, at a total cost of ₱21,913.40.

Provincial Capitol Building. (Province of Oriental Negros.) This is a beautiful concrete 2-story building, measuring 31 meters by 18 meters with galvanized iron roof. It furnishes quarters for these officers: provincial governor, provincial treasurer, district engineer, district health officer, district auditor, division superintendent of schools, and provincial assessor. It is constructed in the new Government Center and replaces the old building which was burned in 1922. The construction work was started on October 11, 1923, and, at the end of the year 1924, was 99 per cent complete, at an expenditure of ₱103,756.95.

Alaminos Presidencia Building. (Province of Pangasinan.) This is a Gumaca Type 2-story concrete building, having the following principal dimensions: first floor, 8.60 meters by 18.50 meters; second floor, 10.30 meters by 20 meters. The first story provides offices for the municipal treasurer, postmaster, police, and jail; the second story provides offices for the municipal president, municipal secretary, justice of the peace, and the session hall. The building was constructed by contract at a total cost of ₱23,038.08.

Binmaley School Building. (Province of Pangasinan.) The original building was the ruin of an old Spanish brick school building which has been rather neglected for a number of years. The Bureau of Public Works made a design for the complete reconstruction of the building with the most economical means possible. It is a 2-story building, measuring 14.20 meters by 49.20 meters. The first floor has 7 classrooms; and the second floor has 7 class, 1 office, and 1 library rooms. The reconstruction work was commenced in June, 1922, and was completed in November, 1924, at a total cost of ₱44,969.53.

Provincial Hospital Building. (Province of Tayabas.) This building is located at Lucena, the capital of the province. The project consists of Stages Nos. 1 and 2 (Standard Plan). The dispensary pavilion, a 1-story concrete building, measures 22.10 meters by 9.90 meters and provides four rooms. The administration building is a 2-story concrete building, measuring 15.20 meters by 15.20 meters and provides 14 rooms. Work was started on January 18, 1924, and was completed on September 30, 1924, at a total cost of ₱66,574. The hospital was opened to the public on January 2, 1925.

The following tables show, by provinces and municipalities, the number and types of buildings completed in 1924:

HOSPITALS

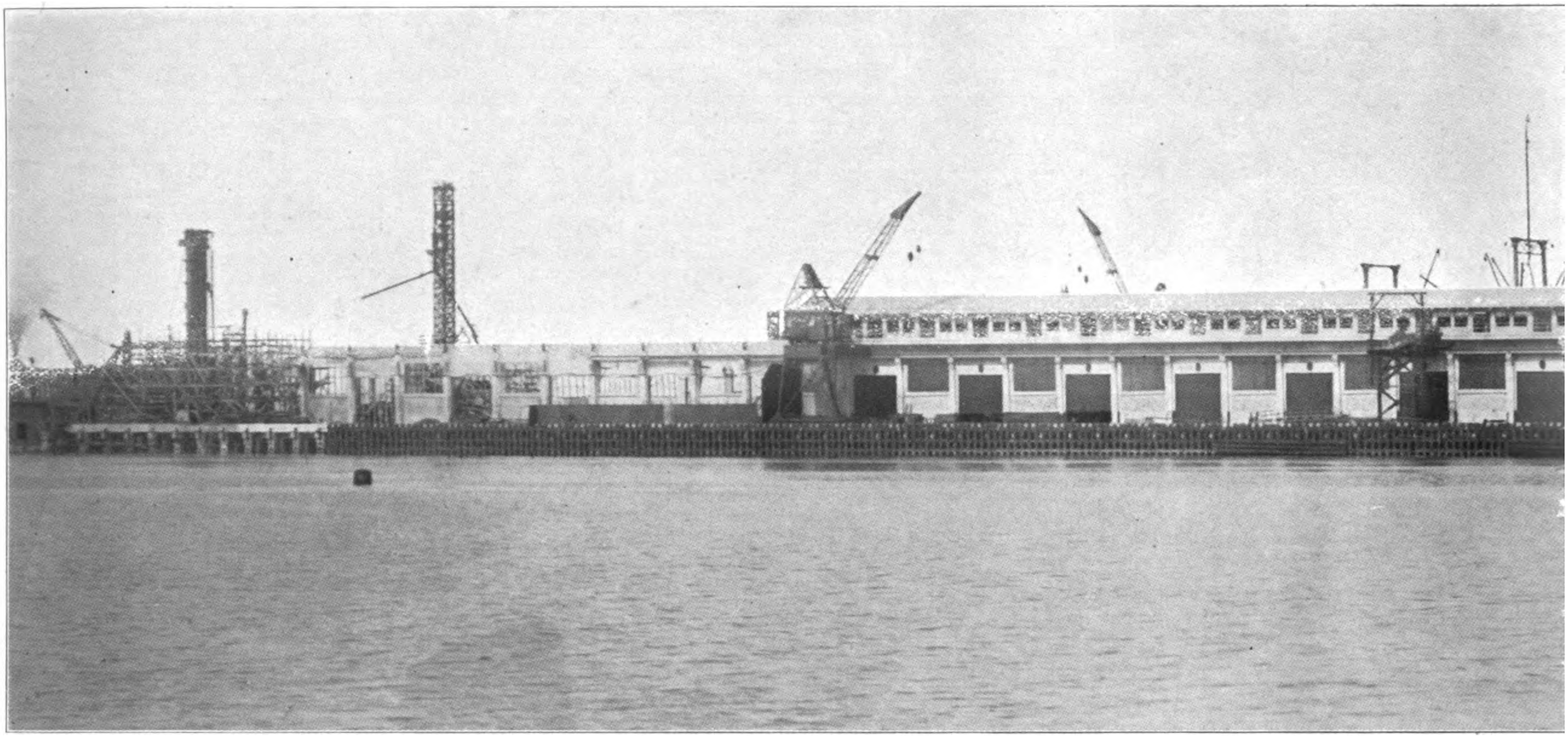
Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Cagayan	Tuguegarao	Additional to Constabulary Barracks Hospital	Concrete and wood with G. I. roof.	5.00× 5.50	163	₱1,330.27
Davao	Mati	1	Wood with G. I. roof	8.00×10.00	696	5,350.00
Do.	Baganga	1	do.	8.00×10.00	696	5,827:00
Ilocos Sur	Vigan	Stage I	Concrete with G. I. roof.	9.90×22.10	872	22,695.35
Laguna	Santa Cruz	Stage I	do.	9.90×22.10	1,434	25,234.63
Nueva Ecija	Cabanatuan	Stage I	do.	9.90×22.10	965	22,621.47
Occidental Negros	Bacolod	Stages I and II	do.	22.60×37.30	3,230	61,639.43
Do.	La Carlota	Emergency ward	Wood with G. I. roof	6.10× 6.10	293	980.00
Pangasinan	Dagupan	Stage I	Concrete with G. I. roof	9.90×22.10	1,253	18,117.29
Tayabas	Lucena	Stages I and II	do.	22.60×37.30	2,976	66,574.00

SCHOOL BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Albay	Ligao	1	Wood with G. I. roof (Plan No. 10)	20.70×50.20—1-story	6,078	₱29,500.00
Baguio, City of		1	Wood with G. I. roof (Special Plan)	11.40×21.00—1-story	1,532	11,935.55
Do		1	Concrete and wood with G. I. roof (Special Plan).	12.40×37.60—1-story	2,914	12,998.76
Batangas	Santo Tomas	1	do.	9.60×32.45—1-story	2,628	21,350.00

SCHOOL BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Batangas	Taal	1	Wood with G. I. roof (Plan No. 3)	9.20×23.20—1-story	1,378	₱10,365.07
Do	Lobo	1	Wood with G. I. roof (Domestic Science)	8.00×11.00—1-story	580	3,558.21
Bohol	Valencia	Add. rooms	Concrete and wood (Plan No. 7)	7.20× 9.20—1-story	536	3,462.89
Do	Guindulman	1	Concrete and wood (Plan No. 10)	21.20×39.20—1-story	4,369	26,978.58
Bulacan	San Miguel	1	Concrete and wood (Plan No. 7)	12.20×20.80—1-story	3,311	39,000.00
Do	San Ildefonso	1	Wood with G. I. roof (Domestic Science)	7.15×14.15—1-story	561	3,533.79
Do	Bustos	1	....do	7.15×14.15—1-story	627	3,208.00
Do	San Nicolas	1	Concrete and wood with G. I. roof (Special Plan).	18.10×10.85—1-story	2,135	21,805.47
Do	San Jose del Monte	2	Wood with G. I. roof (Special Plan)	6.01× 7.90—1-story	431	2,600.00
Cagayan	Enrile	1	Concrete and wood with G. I. roof (Plan No. 7).	12.20×21.20—1-story	1,645	20,872.52
Camarines Sur	Buhi	1	Concrete and wood with G. I. roof (Plan No. 2).	7.20× 9.40—1-story	195	6,133.80
Cavite	General Trias	1	Concrete and wood with G. I. roof (Plan No. 7).	14.20×30.00—1-story	2,852	20,163.68
Do	Noveleta	1	Concrete and wood with G. I. roof (Plan No. 6).	11.70×14.20—1-story	1,156	7,292.46
Do	Julugan	Add. rooms	Concrete and wood with G. I. roof (Plan No. 2).	11.30×14.20—1-story	1,242	7,969.41
Cebu	Asturias	1	Concrete and wood with G. I. roof (Plan No. 5).	21.20×45.40—1-story	5,441	47,077.67
Do	Danao	1	Concrete and wood with G. I. roof (Plan No. 10).	12.50×28.00—1-story	2,634	13,133.98
Do	Cebu	Normal	Concrete and wood with G. I. roof (Special plan).	29.90×60.26—2-story	16,896	299,643.73
Do	Dumanjug	1	Concrete and wood with G. I. roof (Plan No. 20).	11.80×42.40—1-story	5,854	22,263.09
Do	Guadalupe	1	Concrete and wood with G. I. roof (Plan No. 10).	12.50×28.00—1-story	2,634	12,769.09
Iloilo	Molo	1	Wood with G. I. roof (Plan No. 10)	12.00×21.00—1-story	1,931	8,478.96
Do	....do	3 add. rooms	Wood with G. I. roof (Plan No. 5)	9.27×27.00—1-story	1,827	8,478.96
Do	Dumangas	1	Wood with G. I. roof (Domestic Science)	10.00×12.00—1-story	1,243	6,480.35
Do	Cabatuan	3 add. rooms	Masonry and wood with G. I. roof	10.80×22.40—2-story	2,266	8,565.48
Ilocos Norte	Piddig	1	Wood with G. I. roof (Plan No. 10)	12.20×20.80—1-story	4,245	33,647.78
Do	San Nicolas	4 add. rooms	Concrete, brick, and wood with G. I. roof Special Plan).	9.90×10.60—2-story	2,644	28,882.65
Ilocos Sur	Santa Lucia	1	Concrete and wood with G. I. roof (Plan No. 7).	14.20×39.20—1-story	3,131	29,326.28
Laguna	Bay	1	Concrete and wood with G. I. roof (Plan No. 4).	19.20×32.20—1-story	1,909	9,885.14
Do	Lumban	1	Concrete and wood with G. I. roof (Plan No. 7).	14.20×39.20—1-story	3,854	13,172.18
Do	Santa Cruz	3½ add. rooms	Concrete and wood with G. I. roof (Plan No. 20).	11.80×24.70—1-story	2,229	14,348.15
La Union	Aringay	1	Concrete and wood with G. I. roof (Plan No. 7).	14.20×39.20—1-story	3,387	27,198.43
Do	Luna	1	Wood with G. I. roof (Plan No. 7)	14.20×39.20—1-story	3,302	26,736.94
Leyte	Carigara	1	Concrete and wood with G. I. roof (Plan No. 10).	21.20×32.20—1-story	3,072	27,909.86
Do	Malitbog	1	Concrete and wood with G. I. roof (Plan No. 4).	9.20×32.20—1-story	1,903	14,106.88
Manila	(U. P. H. School)	1	Concrete and wood with G. I. roof (Special Plan).	14.00×28.80—2-story	5,421	37,400.00
Do	(U. P. Engineer-Laboratory)	1	Concrete with G. I. roof	10.30×36.02—1-story	2,849	34,763.00
Do	(U. P. Chemical-Laboratory)	1	....do	10.10×36.02—1-story	2,437	30,498.00
Occidental Negros	Himamaylan	Add. rooms	Concrete and wood with G. I. roof (Plan No. 3).	18.00×23.06—1-story	2,382	12,849.98
Do	Bacolod	Add. rooms	Concrete and wood with G. I. roof (Plan No. 10).	11.30×14.00—1-story	840	14,883.00
Do	La Carlota	Add. rooms	Concrete and wood with G. I. roof (Plan No. 20).	11.56×28.70—1-story	2,136	16,127.06
Do	Bago	Add. rooms	Concrete and wood with G. I. roof (Plan No. 7).	11.30×14.00—1-story	840	15,480.00
Do	Victorias	Add. rooms	Concrete and wood with G. I. roof (Plan No. 3).	18.00×23.06—1-story	2,382	12,713.85
Do	Binalbagan	Add. rooms	Concrete and wood with G. I. roof (Plan No. 4).	9.00×27.00—1-story	1,602	11,824.00
Do	Pulupandan	1	Wood with G. I. roof (Plan No. 7) No. 7).	23.20×67.20—1-story	4,636	35,556.79
Do	Cadiz	Add. rooms	Concrete and wood with G. I. roof (Plan No. 7).	11.30×14.00—1-story	840	7,995.00
Do	Manapla	Add. rooms	Wood with G. I. roof (Plan No. 7)	9.20×28.00—1-story	1,585	10,539.25
Do	Escalante	Add. rooms	Concrete and wood with G. I. roof (Plan No. 7).	11.30×14.00—1-story	840	9,123.73
Do	Maao, Bago	1	Concrete and wood with G. I. roof (Plan No. 10-A).	12.20×28.40—1-story	1,672	12,999.00
Do	Talisay	Add. rooms	Concrete and wood with G. I. roof (Plan No. 5).	11.30×14.00—1-story	840	7,506.00
Pampanga	Santa Ana	1	Concrete and wood, with G. I. roof (Plan No. 7).	14.20×30.20—1-story	2,550	20,415.59
Pangasinan	Binmaley	1	Concrete, wood, and brick with G. I. roof (Special Plan)	14.20×49.30—2-story	6,017	44,969.53
Do	Manaoag	1	Concrete and wood with G. I. roof	11.80×28.20—1-story	4,277	26,121.97
Do	Bugallon	1	Wood and sawale with G. I. roof (Plan No. 7).	14.20×39.20—1-story	3,165	17,919.92
Do	Balungao	1	Wood, sawale, and concrete (Special Plan)	11.20×42.20—1-story	2,751	9,038.19
Do	Lingayen	6 add. rooms	Wood, sawalle, and concrete with G. I. roof (Plan No. 10).	11.80×42.10—1-story	3,718	16,643.45
Do	Bolinao	3 add. rooms	Concrete and wood with G. I. roof (Plan No. 7).	11.60×21.10—1-story	1,776	11,055.90
Do	Villasis	1	Wood with G. I. roof (Domestic Science)	9.20×28.20—1-story	1,800	7,151.82
Rizal	Malabon	1	Wood and concrete with G. I. roof (Special Plan).	10.20×21.00—2-story	1,892	14,148.19
Do	Binangonan	1	Wood with G. I. roof (Plan No. 10)	12.20×28.20—1-story	2,795	13,475.00
Do	Teresa	1	Wood with G. I. roof (Plan No. 4-A)	9.20×32.20—1-story	1,937	8,454.00
Romblon	Alcantara-Looc	1	Wood with G. I. roof (Plan No. 4)	9.20×32.20—1-story	1,681	12,311.96
Sorsogon	Juban	1	Concrete and wood with G. I. roof (Plan No. 4).	9.20×32.20—1-story	1,982	13,450.00
Surigao	Ipil	1	Wood with G. I. roof (Plan No. 2)	8.25×24.98—1-story	1,237	2,005.82
Tarlac	Concepcion	1	Wood with G. I. roof	24.50×50.00—1-story	6,968	32,785.77
Tayabas	Quezon	1	Concrete and wood with G. I. (Plan No. 7)	14.20×39.20—1-story	3,460	28,460.35
Do	Lopez	1	Wood with G. I. roof (Domestic Science)	7.50×13.25—1-story	466	4,293.00
Do	....do	2 add. rooms	Wood with G. I. roof (Plan No. 15)	9.00×14.00—1-story	801	7,473.04
Do	Unisan	1 add. room	Wood with G. I. roof (Plan No. 7)	7.00× 9.00—1-story	405	4,725.85
Zambales	San Narciso	1	Wood with G. I. roof (Plan No. 4-A)	9.00×32.00—1-story	2,048	14,190.75
Do	San Felipe	1	....do	9.00×32.00—1-story	2,048	12,215.47
Do	San Antonio	1	....do	9.00×32.00—1-story	2,048	11,019.58
Zamboanga	Mercedes	1	Wood with G. I. roof (Plan No. 10)	12.15×28.08—1-story	4,070	20,644.12



PIER No.

In addition to the school buildings listed above, the following temporary buildings were also constructed during the year.

TEMPORARY SCHOOL BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Iloilo	La Paz	2 add. rooms	Wood and nipa with nipa roof	8.50×18.00—1-story	853	₱1,600.00
Do	Barotac Nuevo	do	do	11.00×14.00—1-story	1,170	1,800.00
Do	La Paz	1	do	9.00×41.00—1-story	2,417	4,001.55

PRESIDENCIA BUILDINGS

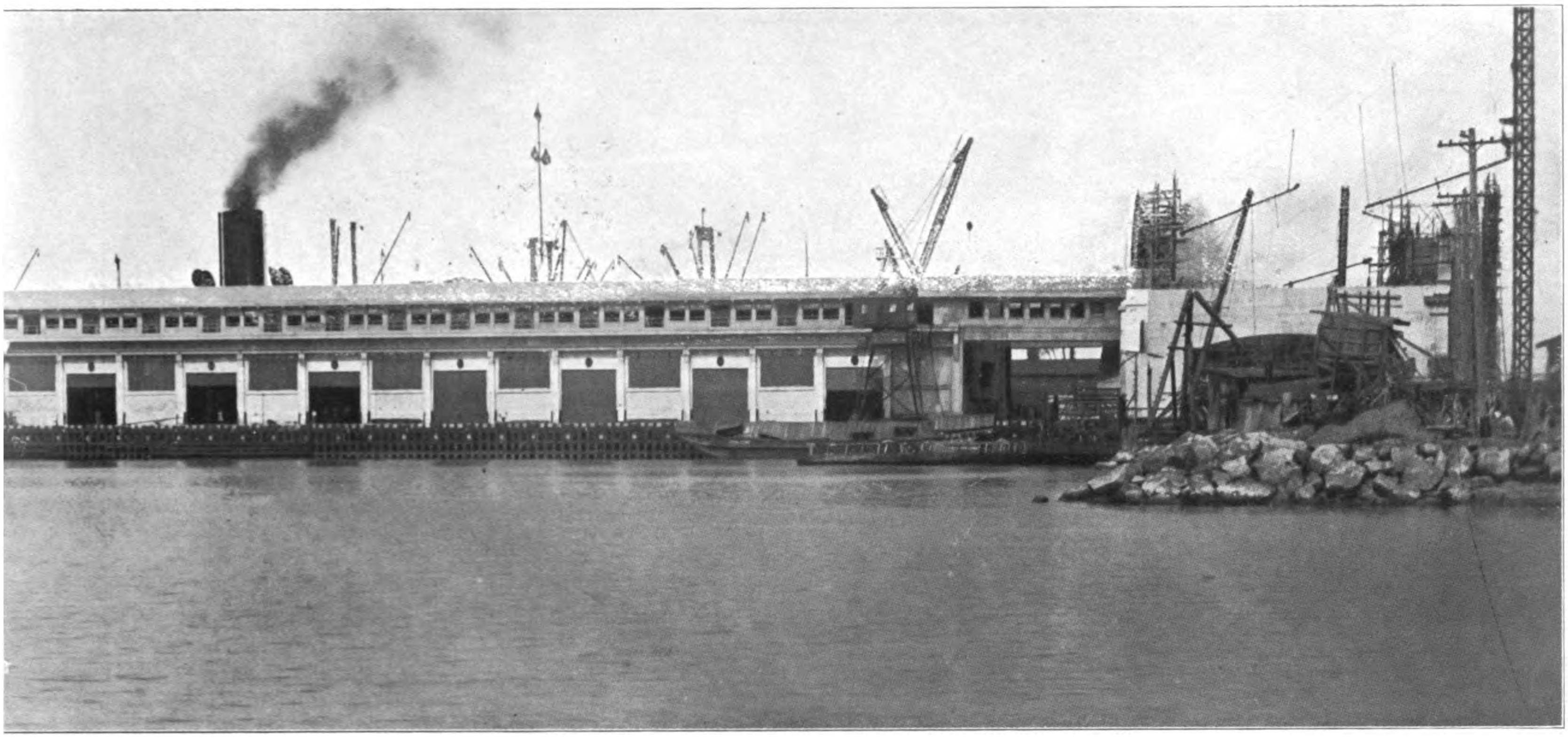
Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Camarines Sur	Iriga	1	Masonry, concrete, and wood with G. I. roof	12.50×24.40—2-story	3,126	₱29,655.39
Iloilo	Igbaras	1	Wood with G. I. roof	7.20×14.20—1-story	1,109	10,036.32
Leyte	Alangalang	1	Concrete with G. I. roof	9.00×15.00—2-story	1,160	42,814.80
Pampanga	Magalang	1	Concrete and wood with G. I. roof	14.20×20.00—1-story	2,225	23,378.46
Pangasinan	Alaminos	1	Concrete and wood with G. I. roof (Gumaca Type)	8.60×18.00—1-story	1,910	23,038.08
Do	Rosales	1	Concrete and wood with G. I. roof	8.60×18.00—1-story	1,910	20,796.09
Tarlac	Ramos	1	Concrete, wood, and sawale with G. I. roof	6.80×11.80—1-story	819	7,194.33
Tayabas	Tayabas	Add. rooms	Concrete and wood with G. I. roof	7.30× 9.50—1-story	658	2,876.00

TEMPORARY PRESIDENCIA

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Mindoro	Mamburao	1	Concrete and wood with nipa roof	8.00×12.00—2-story	572	₱2,725.35
Do	Baco	1	do	7.00×14.00—1-story	812	5,146.86

MARKET BUILDINGS AND TIENDAS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Benguet	City of Baguio	2	Concrete with G. I. roof (tiendas)	2.20× 3.00×22.00	706	₱4,045.10
Davao	Talomo	1	Concrete with G. I. roof (matadero)	8.90× 8.90	356	3,000.30
Do	Davao	1	do	8.90×12.20	499	5,280.00
Do	do	1	do	24.00×39.10	5,026	21,913.40
Ilocos Norte	Dingras	1	do	21.00×39.80	4,589	21,234.38
Nueva Ecija	San Jose	2	do	15.00×27.00	3,788	15,038.51
Pampanga	Macabebe	1	Concrete with G. I. roof (matadero)	4.30× 5.80	105	1,291.27
Do	San Luis	1	Concrete with G. I. roof (earth floor)	6.70×40.00	1,273	1,317.07
Samar	Catarman	1	Concrete with G. I. roof	18.00×26.00	1,844	15,855.40
Do	do	1	Concrete with G. I. roof (matadero)	5.40×20.35	399	5,843.11
Sorsogon	Donsol	1	Concrete with G. I. roof	15.00×35.00	2,450	10,875.00
Tayabas	Tayabas	2	Concrete with G. I. roof (tiendas)	5.00×13.50	515	8,997.00



7, MANILA

MISCELLANEOUS BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
City of Baguio	Comfort Station	1	Concrete with G. I. roof	5.00×12.80—1-story	316	₱4,873.86
Do	Grandstand	1	Wood with G. I. roof	16.60×30.80—1-story	3,305	17,245.01
Do	Baguio	1	Concrete and wood certainteed	10.00×18.00×64′	390	3,304.44
Do	do	1	do	10.00×25.00×90′	771	
Cebu	Cebu (Incinerator)	1	Concrete with G. I. roof	10.00×10.00—1-story	771	4,641.87
Do	Cebu (Explosive Magazine)	1	do	4.40× 6.40—1-story	170	2,803.04
Ilocos Sur	Vigan (Closets)	2	do	2.40× 6.00—1-story	100	3,739.87
Manila	Animal House	1	Concrete and wood with G. I. roof	10.00×12.00—2-story	704	21,659.00
Do	Cargo sheds	1	do	96.81—90.71×26.25—2-story.	56,608	825,000.00
Pangasinan	Dagupan (laundry, bath, and toilet).	1	Concrete with G. I. roof	8.00× 8.00—1-story	311	6,878.17
Tarlac	Tarlac (Storeroom and toilet)	1	do	3.00× 9.00—1-story	132	1,054.77
Do	Tarlac (Residence House)	1	Wood with G. I. roof	8.00×19.00—1-story	1,249	13,218.40
Tayabas	Tayabas (Bodega)	1	Concrete and wood with G. I. roof	12.00×12.00—1-story	528	3,103.00

The following tabulation shows the number of durable buildings constructed since 1909 to December 31, 1924, their cubical contents, and costs.

Year	Number of buildings completed				Total number of all durable buildings	Total content cubic meters	Per cent reinforced concrete by content	Expenditures on buildings completed, buildings under construction, also maintenance of buildings
	Schools	Markets and tiendas	Hospitals	Other durable buildings				
1909	15		2	20	37	No data	No data	₱1,921,284.63
1910				44	44	No data	No data	1,695,737.25
1911	56		10	92	158	206,368	64	2,923,351.32
1912	98	9	3	71	181	255,640	72	2,657,601.33
1913	88	15		41	144	409,025	85	1,864,666.67
1914 (6 months)	25	25		4	54	184,160	92	1,406,881.80
1914	69	51	1	15	136	370,723	92	2,703,485.94
1915	72	54	4	24	154	522,746	76	2,478,030.29
1916	67	17	1	27	112	261,496	85	2,046,243.43
1917	32	15	2	33	82	160,888	70	2,015.232.37
1918	27	19	2	36	84	220,943	56	2,706,443.65
1919	19	11	1	45	76	159,254	64	4,792,524.86
1920	47	12	3	20	82	229,653	65	5,925,042.45
1921	79	25	3	41	148	363,735	71	6,774,633.74
1922	49	15	1	46	111	314,014	88	4,287,121.76
1923	50	8	3	27	88	212,485	70	2,275,758.26
1924	76	15	12	21	124	308,177	69	2,911,816.19

PORT WORKS CONSTRUCTION, IMPROVEMENT, AND SEASHORE PROTECTION

Manila.—(See Designing Division's report.)

Bohol.—The work accomplished on the Loay Port consisted in the completion of the two outside jetties. The original work comprises the deepening of the channel, and the construction of beacons and 867 linear meters of jetties. During the year, 160 linear meters of the jetties were completed and also the beacons. However, it was found that the established grade for the top of the jetties was 50 centimeters below the high tide mark so the raising of the grade 85 centimeters higher was started, but due to the incle-

Provincial Hospital, Lucena, Tayabas

ment weather, was not completed. The total expenditure incurred was ₱10,183.34.

On the Tagbilaran wharf 170 linear meters of cause-way were completed requiring 7,842 cubic meters of rock at a total cost of ₱11,965.40.

Cagayan.—Only 75 linear meters of rubble masonry wall on the Aparri seashore protection were completed. The project contemplates the construction of one kilometer of sea wall, the remaining unfinished part of which will be of reinforced concrete. The total expenditure is ₱40,102.05, including ₱9,000 worth of materials delivered at the site.

Cebu.—The principal work accomplished in Cebu during the year consisted in the installation of 12 clusters of Apitong creosoted fender piles consisting of 7 piles per cluster. Also, a wooden stiff leg derrick with a capacity to lift a 4-ton load was constructed. The total expenditure is ₱89,781.70.

Samar.—An extension of 94 linear meters was made on the original jetty requiring 3,392.05 metric tons of rock. The furnishing of the rock was awarded to Isabelo and Muñoz Company at ₱3.50 per metric ton. The total expenditure amounted to ₱19,677.14.

Sorsogon.—The Casiguran sea wall along the northwestern side of the poblacion of the town of the same name was constructed. This wall is 169 lineal meters long consisting of big boulder riprap. During the December typhoon, it was observed that no damage was done on the protected side of the poblacion. However, it will be necessary to extend same to the eastern shore of the Casiguran River. The total expenditure incurred so far is ₱4,480.77.

Sulu.—In Jolo, a reinforced concrete deck girder type wharf, 12.50 meters by 60.10 meters, supported by reinforced concrete piles was under construction. The project was contracted by the Mas Construction Company. The project was 70 per cent completed at the end of the year with a total expenditure of ₱99,004.75.

PORT WORKS AND MAINTENANCE

The floating equipment was in good condition thruout the year, as a larger sum of money was expended for repairs.

The usual difficulty in coping with shoaling in the Lower Pasig and the South Harbor at Manila was experienced, due to the limitations of available equipment.

One new steel, self-dumping scow was purchased by contract from the Atlantic, Gulf and Pacific Company, the contract price being ₱56,000. The scow is a duplicate of the one acquired last year and brings the total of the 60 cubic meter class scows up to three. There should be at least five of these scows available and two more should, therefore, be acquired at once.

Dredge No. 4 was practically rebuilt at Engineer Island and was idle after its arrival at Manila in January.

The hull was stiffened, a new A-frame installed, and the machinery thoroughly overhauled. Two boilers were purchased as salvage from U. S. S. *Monadnock* and were installed to replace the defective boilers of this dredge. The new boilers, built to Navy standards, are a fortunate acquisition, in view of prevailing prices.

The two ladder dredges continued in alternate service in the Lower Pasig. It is hardly necessary to state that both dredges in operation throughout the year are not more than sufficient to cope with dredging requirements of the Lower Pasig, and that until another scow is obtained, some obstructions to navigation must be anticipated.

The launch *Resolute* functioned well and promises to be a thoroughly satisfactory towing unit, both from a fuel-economy standpoint and in economy of upkeep. Adaptation of internal combustion engine driven electrical propulsion to small service tugs seems the next logical step in the development of equipment of this class for Philippine conditions.

An accurate check on the dredging work, including the measurements for contract payments for the removal of dredge spoil was done.

Good progress was made on estero dredging. The Binondo Estero was thoroughly dredged throughout and a good start was made on the Estero de la Reina. It is planned to give all possible attention to these important waterways during the present year, since traffic is increasing as business expansion takes place.

In regard to outlying ports, it should be noted that although a very large quantity of material was dredged at Iloilo and a depth of

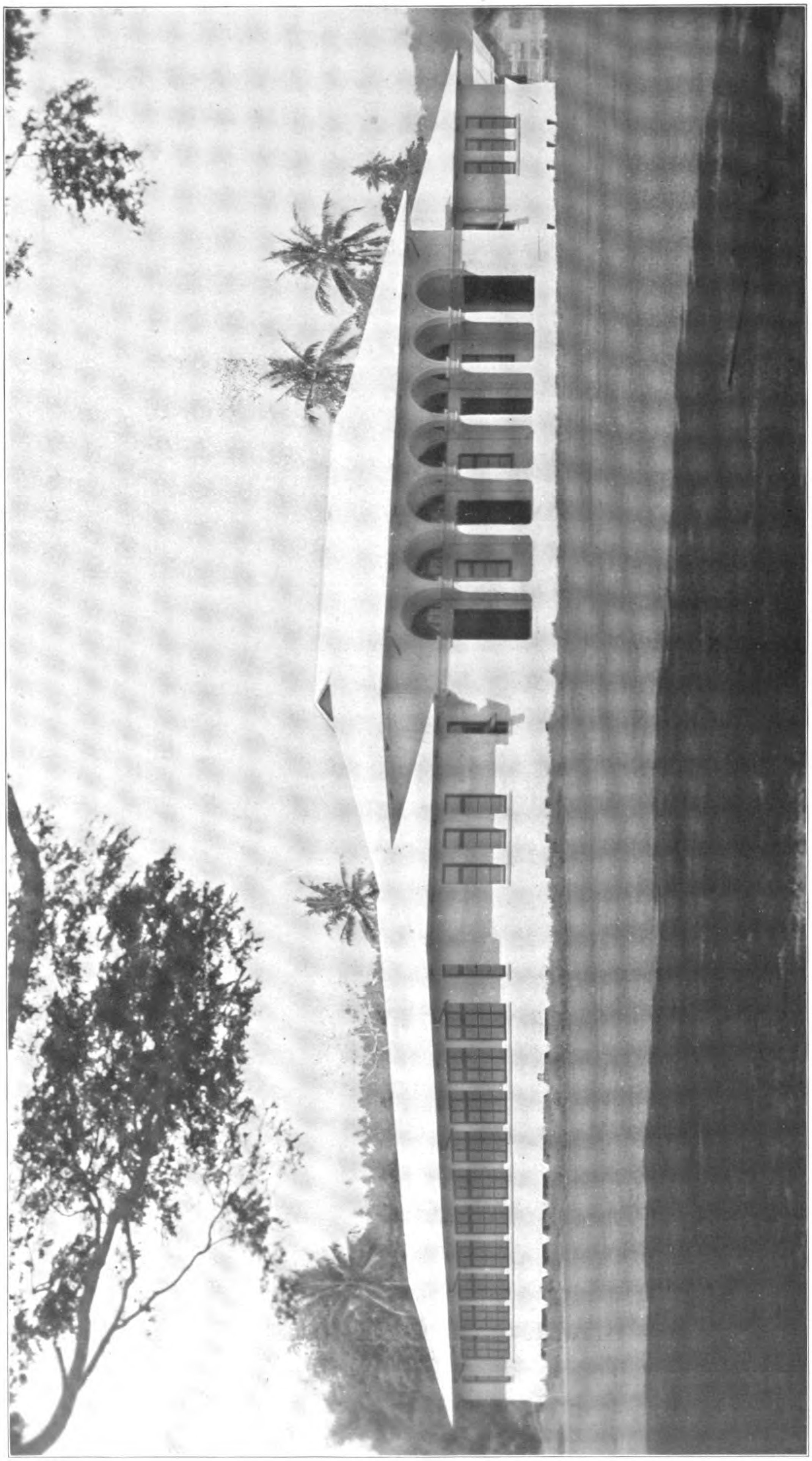
Provincial jail and court house, Malolos, Bulacan

30 feet established over the bar at the river entrance, shoaling occurred so rapidly that within a short time the depth was reduced to 16 feet. Dredging must be regarded as not only a costly but also a purely temporary means of keeping the Iloilo River at the required depths. It is clear that the solution of this problem lies in the prevention of shoaling, rather than in dredging for maintenance.

The following tabulation shows the extent of work accomplished during the year:

Dredging operations, 1924

Location	Total, 1902 to 1923	Total for 1923	Steamship *Dredger*	Dredges							Total
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	
	Cu. m.	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*
Lower Pasig River	7,273,590	263,100	49,000	130,440	83,660						7,536,690
Outer Harbor	3,626,819	360,000	360,000								3,986,819
Upper Pasig River	1,004,060	11,326							2,406	8,920	1,015,386
Inner Basin	530,179										530,179
Binondo Estero	70,189	8,642						8,642			78,831
Estero de la Reina	234,663	17,657						6,811	10,846		252,320
Paco Estero	38,109										38,109
San Miguel Estero	59,285										59,285
Provisor Estero	31,681										31,681
Marine Railway Engineer Island	44,767										44,767
Talim Island (City)	1,071										1,071
Outer Bar	1,304,054	26,080		12,800	13,280						1,330,134
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580										16,580
Engineer Island Canal	30,180	7,360		7,360							37,540
Vitas Estero	392,975										392,975
Quiapo Estero	12,507										12,507
Cegado Estero	35,509										35,509
Pandacan Estero	172										172
San Lazaro Estero	22,975										22,975
Corregidor Harbor, Quartermaster	54,956										54,956
Iloilo River	2,420,020										2,420,020
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	28,920										28,920
District of Cavite	20,876										20,876
Tondo Beach	9,013										9,013
Santibañez Estero	24,216										24,216
Tanque Estero	28,057										28,057
Tacloban Wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato River	49,462										49,462
Earnshaws Slipways	55,113										55,113
Los Baños Pier	2,149	9,011				9,011					11,160
United States Navy, Cavite	749,920										749,920
Concordia Estero	10,047										10,047
Malabon Canal	36,821										36,821
Port Libas, Capiz	26,490	4,923					4,923				31,413
Napindan Bar		81,431				81,431					81,439
Totals	18,881,556	789,530	409,000	150,600	96,940	90,442	4,923	15,453	13,252	8,920	19,671,086



ALBAY HIGH SCHOOL, ALBAY

TELEPHONE SYSTEMS

Cotabato.—The sum of ₱15,000 was set aside at the beginning of the year for the operation of telephone lines in the Province of Cotabato. About 480 kilometers of telephone lines with three centrals have been under operation in this province during the year and the system has given fairly satisfactory service.

Cagayan.—The sum of ₱18,000 was appropriated from the provincial funds of Cagayan for the installation of telephone lines and the necessary apparatus. It is contemplated to have two centrals, one at Tuguegarao and the other at Aparri. About 100 kilometers of wire were installed during the year. The materials for 200 kilometers of line including apparatus are already requisitioned. This project is estimated to cost ₱36,000 with a total expenditure of ₱17,849.89 incurred so far.

DESIGNING DIVISION

E. C. EARLE, *Chief Designing Engineer*

In line with the policy approved after the close of the war, the construction of temporary structures has been discouraged and plans have been therefore prepared during the past year only for structures to be built of permanent materials.

With the very limited appropriation available for port and bridge projects, considerable difficulty was experienced in preparing suitable plans for the various structures, however, where funds were insufficient to construct a project in its entirety, plans were so made as to permit work to be undertaken on a part of the project with permanent materials rather than resort to the former war time practice of completing projects with materials of temporary nature. In this manner several projects will be brought to completion during the new year and others will be finished during the year 1926,—all permanent. This policy has somewhat retarded the opening of some projects, however, it ultimately will be productive of the greatest benefit.

As has been the case for the past few years, the shortage of experienced technical personnel has continued to be felt in the Designing Division and, with the accumulation of work for some time past it has been increasingly more difficult to cope with all of the projects for which funds have been available.

OFFICE

A noted improvement of the quality of concrete entering all structures built for the Government has resulted from the vigorous methods employed during the past two years. A total of 3,678 tests on cement (representing 36,780 barrels), 1,894 on concrete, 102 on sand and 70 on gravel were made. The number of tests made represent an increase of approximately 60 per cent over those made during 1923.

An extensive study was made in connection with the proposed electrification of the Insular Ice and Cold Storage Plant and recommendations governing the operation of this plant were submitted. A study and investigation was also made of the Culion, Fish, Ice and Electric Co., Inc., with a view to ascertaining the earnings of the said company and fixing rates governing their future operation.

Approximately 354 foreshore lease applications were handled, representing an increase of about 120 per cent over those handled during 1923.

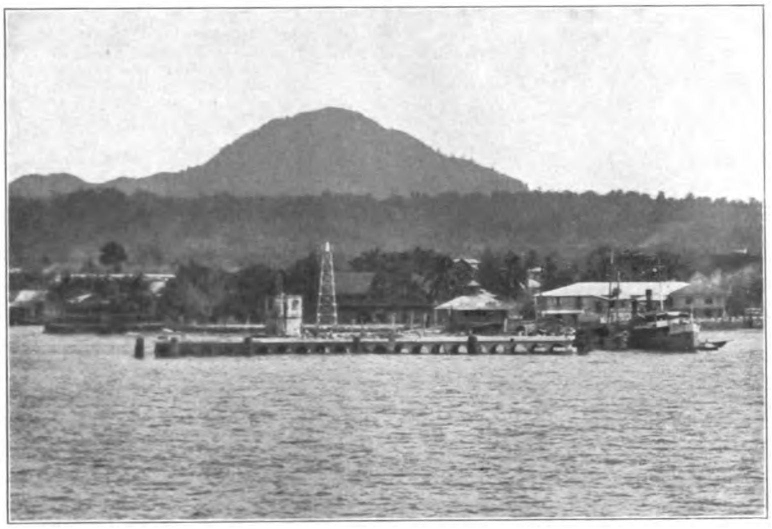
Plans, specifications, and estimates were prepared or studies and recommendations made during the year for bridge projects, port works projects, pumping and power plants, wireless stations, tanks, equipment such as launches, scows, etc. as listed in Tables A, B, C, D, and E.

TABLE A.—*Wireless masts*

Project	Location	Type	Height	Remarks
Santo Domingo de Basco Station.	Santo Domingo de Basco, Batanes.	Steel tower.	200 feet.	Repairs to anchorage and guys.

TABLE B.—*Bridges*

Province	Road	River	Type of structure	Remarks
Bulacan	Manila-North	Quingua	R. C. girders	Length, 32 ft.
Capiz	Capiz-Panay	Banica	do	Length, 188 ft.
Cagayan	Aparri-Isabela	Apoagonan Estero	do	Length, 148 ft.
Baguio, City of	Baguio-Antamok	Teachers' Camp Creek.	Steel arch	Length, 165 ft.
Ilocos Sur	Manila-North	Sevilla Creek	R. C. girders	Length, 108 ft.
Do	Manila-North	Cabugao	Concrete	Protection works.
Leyte	Baybay-Inopacan.	Pumpunan	Timber trusses	Length, 68 ft.
Mountain Province.	Naguilian-Baguio.	Ribsuan	Suspension bridge	Length, 220 ft.
Do	do	Irisan	Steel truss	Length, 61 ft.
Do	Benguet	Bued	Steel towers only	Length, 260 ft.
Nueva Ecija	Manila-North	Peñaranda	Collapsible R. C. Pile bents.	Length, 280 ft.
Occidental Negros.	Bacolod-South	Bago	Steel trusses	Length, 284 ft.
Pangasinan	Rosales-Nueva Vizcaya.	Bitong	R. C. girders	Length, 70 ft.
Do	do	Iris Creek	do	Length, 50 ft.
Do	Dagupan Lingayen.	Binmaley Delta	do	Length, 164 ft.



Jolo Wharf, Sulu Province

TABLE C.—*Port works*

Province	Port	Type of structure	Remarks
Cavite	Dalahican Peninsula	Breakwater	Plans.
Cebu	Cebu	Rock Jetty	Plans and specifications.
Palawan	Puerto Princesa	Pier	Suspension.
Do	Coron	do	Revised plans.
Zamboanga	Zamboanga	Wharf	Plans and specifications.

TABLE D.—*Electric installation and power plants*

Province	Location	Type	Remarks
Batangas	Dispensary Building	Wiring	Plans and specifications.
Do	Taal	Generator	Installation.
Bohol	Tagbilaran	Lighting and pumpingplant.	Plans and specifications.
Bulacan	Malolos	Pumping plant	Plans and contract.
Cavite	Indang	do	Plans and specifications.
Do	Cavite	do	Do.
Cebu	Opon	do	Repairs.
Camarines Sur	Iriga Presidencia	Wiring	Plans and specifications.
Do	Iriga	Lighting plant	Do.
Iloilo	Iloilo Normal School	Wiring	Do.
Ilocos Sur	Vigan Dispensary	do	Do.
Do	do	Lighting plant	Do.
Laguna	Santa Cruz Dispensary.	Wiring	Plans and specifications.
Manila	Insular Building	do	Do.
Do	Pier N. 7	do	Installations.
Do	Pier Head	do	Do.
Do	Store House, Philippine General Hospital.	do	Plans and specifications.
Do	U. P. High School	do	Do.
Do	Engineering Laboratory.	do	Do.
Mountain Province	Baguio	Hydro-electric plant	Supervision and installation.
Do	do	Telephone system	Development.
Do	do	Lake fountain	Plans and specifications.
Nueva Ecija	Cabanatuan Dispensary.	Wiring	Do.

TABLE D.—*Electric installation and power plants*—Continued

Province	Location	Type	Remarks
Occidental Negros	Bacolod administration and dispensary.	Wiring	Plans and specifications.
Pangasinan	Dagupan Dispensary	do	Do.
Samar	Calbayog Presidencia	do	Do.
Tarlac	Tarlac Hospital	do	Do.
Tayabas	Lucena Administration Building.	do	Do.
Zamboanga	Zamboanga Dormitory.	do	Do.

TABLE E.—*Investigations, studies, reports, and recommendations*

Province	Location	Type	Remarks
Albay	Albay	Hydro-electric generating plant.	Study and recommendations.
Batangas	Bauan	Pumping and lighting plant.	Investigation.
Capiz	Libas	Pier and breakwater	Do.
Cebu	Barili	Hydro-electric	Study and investigation.
Lanao	Momungan	Pumping plant	Study and recommendation.
Occidental Negros	Pulupandan	General port improvement.	Investigation.
Pangasinan	Dagupan	Pumping plant	Study and estimates.
Palawan	Culion	Hydro-electric plant	Investigation.
Tarlac	Tarlac	Water supply system	Preliminary study.
Do	do	Pumping and lighting plant.	Preliminary investigation.

FIELD

The Designing Division accomplished a considerable amount of work in the field during the year.

Cement gun and sand-blast outfits were kept in operation in the Provinces of Cebu, Leyte, Ilocos Norte and at Manila on the repair of bridges and buildings and in connection with the painting and repair of steel and other structures. Calyx-core drills were busy during the year in the Provinces of Nueva Ecija, Nueva Vizcaya, Bulacan, Pangasinan, Leyte, and Occidental Negros on numerous bridge, wharf, and pier projects. Increased efficiency on the part of the crews handling this equipment was noted. The results obtained with the calyx-core drills greatly facilitated the preparation of designs for structures and enabled this division to prepare its specifications more intelligently,—especially as regards the methods to be employed in construction.

At Los Baños a better quality of rock was put out by the new Insular Quarry. As the new site has no over-burden, rock is being produced at a decrease in cost. A gravity system for handling the rock between the quarry face and crushers has been installed and plans are now under way looking to the electrification of the entire plant. The pipe line for the new hydro-electric has been purchased and a water wheel manufactured. With the complete electrification of the plant, it will be possible to produce crushed rock for the many roads and construction projects in the central portion of Luzon at a very nominal figure,—at the same time insuring the supply of an adequate quantity of hard rock.

A considerable number of electrical and mechanical installations were supervised, including the crusher plant at Baguio, the erection of a new floating derrick for Cebu, remodeling Niles cranes for Pier No. 7, installation of water and oil supply system for Pier No. 7, water works pumps for Tubigon, Bohol, water works pumps for Opon, Cebu and for Dumanjug, Cebu, installation of generator and new switch-board for Taal, Batangas, installation of new unit for the Baguio hydro-electric and adjustment to automatic control of Balisong pumps set at Taal, Batangas.

The commissioning of Pier No. 7 on July 7, 1924, marked an epoch of great importance in the development of Manila's harbor improvement program. Excellent progress was made during the year on the construction of this project in spite of the fact that deliveries of steel sash, steel rolling doors and all electrical equipment including the inside overhead cranes, exterior gantry cranes and substation converting machinery were delivered long after the time fixed in the purchase contracts. The opening, consequently, was delayed a number of months. Pier No. 7,—240 feet wide and 1,400 feet long, with berthing capacity for four of the largest type of vessels plying the Pacific,—is one of the finest structures of its kind in the world and is unsurpassed by any structure in the Orient or on the Pacific Coast of the United States. Replete with all its modern cargo handling machinery and other facilities, it stands out as one of the most modern of terminals.

Six modern exterior Semi-portal Gantry Cranes were installed and commissioned at the opening of the pier. The substation for the conversion of alternating current to direct current for the operation of all cranes and hoisting mechanism was located on the upper deck of the structure approximately 700 feet from shore. The plans for this station provide for the installation of four synchroneous converter units, each of 300 KVA. During the year two of these units were installed. Alternating current, measured on the primaries, is purchased from the Manila Electric Company under an advantageous contract and is brought into the converter room at 3,300 volts where it is stepped down and delivered to the converters at 175 volts. The output is direct current at 250 volts.

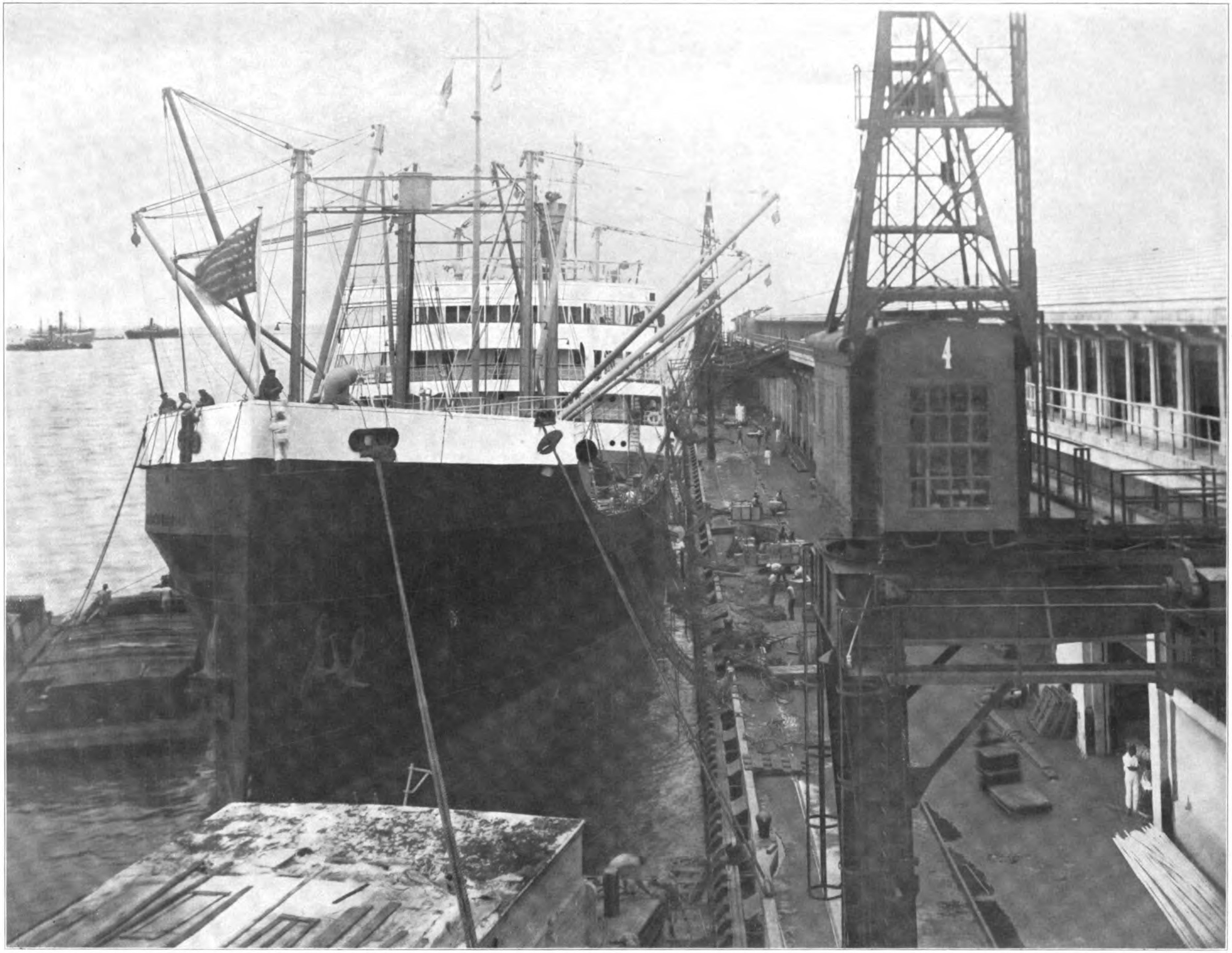
The pier is equipped throughout with an extensive telephone and call bell system, a fuel oil and fresh water system for the use of vessels berthing at the pier and an effective fire protection service of 20 odd hydrants.

A novel feature of the terminal is the overhead passenger passageway which runs along the outer edges of the transit shed at the second level. The use of this passageway enables passengers to reach the ship's deck without the necessity of passing through the more or less dangerous areas utilized for the loading, unloading and storage of freight. Ship's decks are reached by ascending stairs in the Pierhead or (later) by using the elevators situated adjacent to the baggage room, and thence by passing through the overhead passageway to a movable bridge connecting the passageway with the deck of vessels.

The results of the past six months operation have brought out the fact that cargo is now handled more rapidly and cheaper at Manila (Pier No. 7) than at any other port on the Pacific and that vessels are now cleared and turned around in half to two-thirds of the time formerly required. A recent record made consisted in the handling of 7,500 tons of general cargo aboard one of the President type vessels in 26 hours. Testimonials from Steamship Companies state that the new terminal structure is unsurpassed at any port touched by their Oriental service. The overhead passengers facilities, eliminating passengers from the freight deck, are responsible to no mean degree for the efficiency obtained in cargo handling and for the rapid dispatch of vessels berthing at the new structure. Rail connections will link up the pier with all points on the Manila Railroad Company's lines and with local warehouses.

At the close of the year the *Pier proper* as a whole was approximately 86 per cent complete, the *Pier head* about 85 per cent; while the north cargo entrance shed was 100 per cent and the south cargo entrance shed 46 per cent complete.

Towards the latter part of December, serious foundation difficulties were met at the outer end of the pier in the form of an apparent fault or termination of the higher ledge rock heretofore encountered over the pier site, necessitating the lengthening of piling from 40 to 60 per cent. This condition will practically double the cost of the substructure foundation over the remaining portion of the pier and has already resulted in a very marked reduction in driving progress,—the extra depth requiring the use of a larger plant and double driving.



PIER No. 7, MANILA

DIVISION OF ARCHITECTURE

JUAN M. ARELLANO and TOMAS MAPUA, *Supervising Architects*

The work accomplished by this Division is shown in the following tabulation of projects assigned to Messrs. Arellano and Mapua, respectively:

Projects assigned to Mr. Arellano showing status of each

Manila projects	Status
1. Insular Government Building	Full-size details in preparation.
2. Mail Receptacle, Bureau of Posts	Completed.
3. Automobile Parking Space, Sunken Garden	Do.
4. Development of Dr. Jose Rizal Stadium	Do.
5. Proposed Ornamental Light Trolley Pole for Meralco.	Do.
6. Harrison Park Development	Do.
7. Monument, Francisco Baltazar	Preliminary drawings completed.
8. Paco Cemetery	Pending for lack of data.
PROVINCIAL PROJECTS	
1. Iloilo Normal School, Iloilo	F. S. D. completed.
2. Laoag Normal School, Ilocos Norte	Do.
3. Del Pilar Memorial School, Bulacan	Completed.
4. Batangas Provincial Building	Plans in preparation.
5. Jaro (Iloilo) Town Planning	In preparation.
6. Plaza, municipality of Isabela, Occidental Negros	Completed.
7. Proposed provincial store house, Lucena, Tayabas	Preliminary plans completed.
8. Banstand, Bacolod, Occidental Negros	Working drawings completed.
9. Monument, Thomas Hanley, Zamboanga	In preparation.
10. Layout of Capitol and Hospital, Batangas	Completed.
11. Plan of development of the town and plaza, Isabela, Occidental Negros.	Do.
12. Plan of development of the town and plaza, Candelaria, Tayabas.	Do.
13. Plan of development of the town and plaza, Talim, Rizal.	In preparation.
14. Plan of development of the town and plaza, Himamaylan, Occidental Negros.	Completed.
15. Plan of development of the town and plaza, Silay, Occidental Negros.	Do.
16. Plan of development of the town and plaza, Bacnotan, La Union.	Do.
17. San Jose plaza and town layout	In preparation.
18. Misamis proposed government center	Pending.
19. Calabanga town planning	Do.
20. Fountains, Bacolod Plaza	Drawings and models completed.
21. Alteration and addition, Vigan Provincial Building	In preparation.
22. Bacnotan Municipal Building, La Union	Working drawings completed.
23. Pili Presidencia, Camarines Sur	Do.
24. Zamboanga town planning	Pending.
25. Development plan of the town and plaza, Naga, Camarines Sur.	Completed.

Projects assigned to Mr. Tomas Mapua showing status of each

Manila projects	Status
1. University High School, University of the Philippines.	Working drawings completed.
2. Store house and sterilizing buildings, Philippine General Hospital.	Preliminary plans were prepared and working drawings completed.
3. Guazon Memorial Amphitheater, Philippine General Hospital.	Preliminary plans (3 schemes) were prepared and working drawings nearing completion.
4. Auditorium, University of the Philippines	Preliminary plans submitted.
5. Armory, University of the Philippines	Do.
6. Arellano Memorial Tablet, Postigo Building	Design prepared.
PROVINCIAL PROJECTS	
1. Arellano School, Bataan	Full-size details were prepared.
2. Dumaguete Capitol Building, Oriental Negros	Do.
3. Vigan Standard Hospital, Ilocos Sur	Location plan was prepared.
4. Baguio Comfort Station, Benguet	Preliminary plans were prepared and working drawings completed.
5. Romblon Provincial Prison, Romblon	Working drawings and location plan completed.
6. Iloilo Provincial Building, Iloilo	Ceilling plan over the Assembly Hall was revised.
7. Annex Provincial Building, Iloilo	Preliminary plans prepared and working drawings completed.
8. Standard Provincial Hospitals	Full-size details prepared.
9. Magalang Presidencia, Pampanga	Do.
10. Standard Domestic Science Building, Bureau of Education.	Working drawings completed.
11. Laoag Provincial Building, Ilocos Norte	Ceiling plan was revised, plans for the general layout and approaches prepared.

Projects assigned to Mr. Tomas Mapua showing status of each—Ctd.

Manila projects	Status
12. Bath house and swimming pool, Opon, Cebu	Preliminary plans submitted.
13. Provincial jail, Pasig, Rizal	Preliminary plans for the second story addition were prepared. Working drawings are nearing completion.
14. Concepcion Presidencia, Iloilo	Preliminary plans were prepared.
15. Dumalag Presidencia, Capiz	Working drawings for second story addition completed.
16. Standard School plan No. 10-A, Bureau of Education.	Working drawings were revised and completed.
17. Rizal Monument, Laoag, Ilocos Norte	Preliminary plans were prepared and working drawings completed.
18. Tarlac High School, Tarlac	Development plan of the ground was prepared.
19. Pozorrubio Presidencia, Pangasinan	Location plan was prepared.
20. Balungao Presidencia, Pangasinan	Do.
21. Calbayog Presidencia, Samar	Complete plans were prepared.
22. Bohol Provincial Hospital, Bohol	Location plan was prepared.
23. Cuyo Hospital	Plans for the addition and alteration completed.
24. Batanes Provincial Building	Preliminary plans submitted.
25. Southern Islands Hospital, Cebu	Roof construction over terrace completed.
26. Rizal Monument, Palo, Leyte	Preliminary plans submitted.
27. Tagbilaran Girls' Dormitory, Bohol	Do.
28. Standard Hospital, Antique	Location plan was prepared.
29. Standard Hospital, Sorsogon	Do.

The amount of work accomplished during the year is considered satisfactory taking into account the limited personnel of the division. No work of architectural importance has been carried through due to the scanty appropriations for the various projects. Several sketches have, however, been prepared for some important projects which tend to set a higher standard in architecture.

IRRIGATION DIVISION

A. D. WILLIAMS, *Chief Irrigation Engineer*

INSULAR IRRIGATION PROJECTS

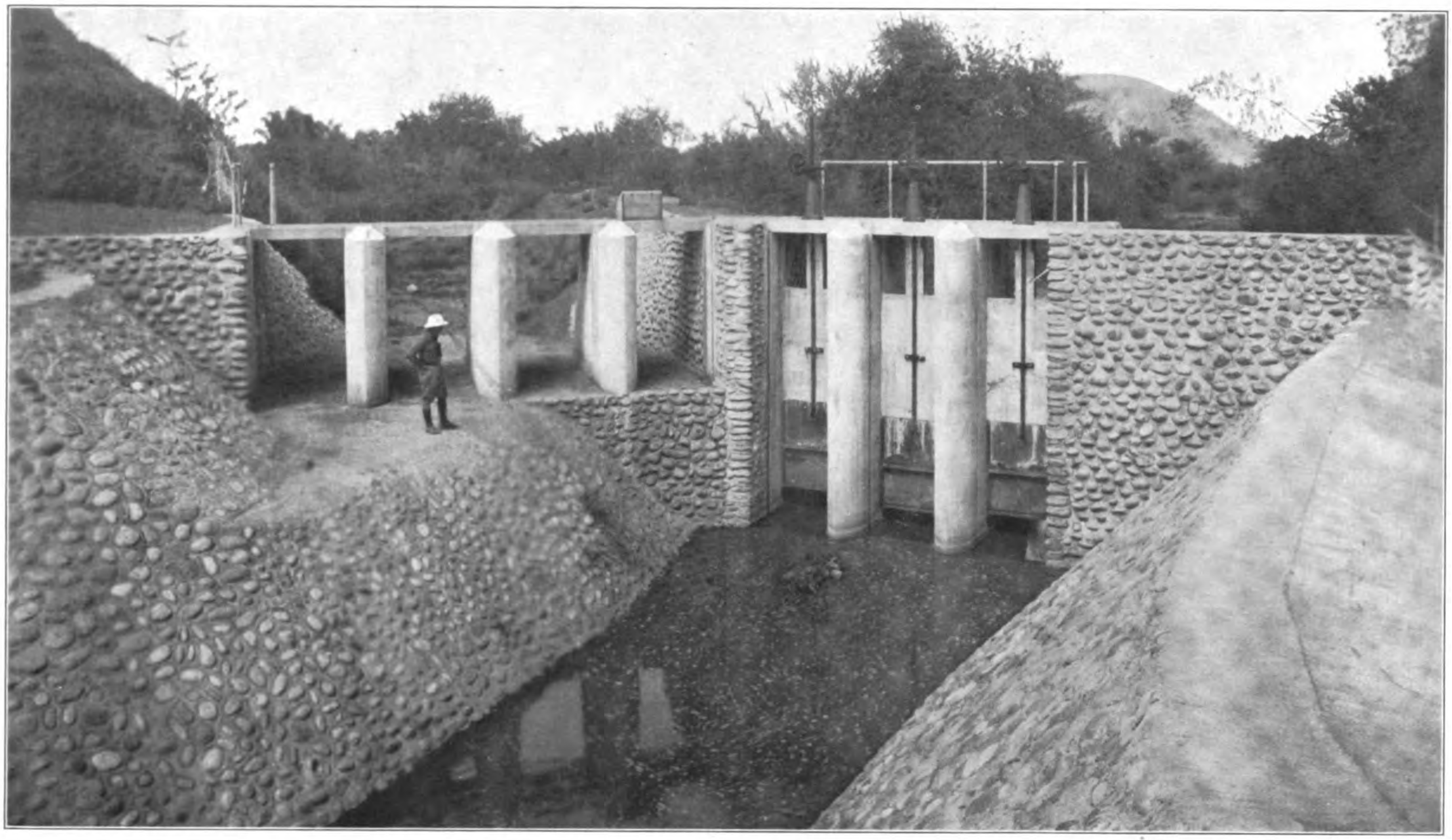
Construction work during 1924 was confined to projects on which construction was authorized during previous years. Of these projects, the Aganao River irrigation project in Iloilo was completed and officially opened on September 1, 1924. This project cost ₱917,000 and embraces an area of 5,500 hectares. An additional unit of the Talavera River project in Nueva Ecija was also completed and opened on July 15, 1924.

Funds totaling ₱2,771,340 were released during the year from the sale of bonds authorized by Act 3013 for continuing construction work on projects under way and for starting the construction of the Peñaranda River project in Nueva Ecija and Bulacan and the O'Donnell River project in Tarlac. The Peñaranda and O'Donnell projects were approved for construction in 1923 but work was held in abeyance until November, 1924, due to the lack of funds.

Fairly satisfactory progress was made on all projects under way notwithstanding interruptions on several projects due to the delay in releasing funds. The anthrax quarantine regulations which were enforced for several months in Central Luzon also interfered with the work of contractors on the Angat River project in Bulacan. With sufficient funds now available six projects should be completed during the dry season of 1925 and also the south system of the Angat River project which will serve an area of 15,000 hectares.

The status of all insular projects which have been financed from these funds, or approved for construction since the reorganization of the division in 1918 is given in the following table:

Project	Province	Irrigable area	Estimated cost	Allotments authorized	Total expenditures and liabilities	Percentage of work completed
		Hectares				
Trinidad	Mountain Province	200.0	₱40,000	₱40,000	₱40,000	Completed (1921).
Santa Barbara	Iloilo	4,945.6	692,000	692,000	692,000	Completed (1922).
Dingras	Ilocos Norte	1,009.5	130,000	130,000	130,000	Completed (1922).
Baruyen River	do	810.7	89,000	89,000	89,000	Completed (1923).
Naic	Cavite	676.0	300,000	292,000	292,000	Do.
Aganao River	Iloilo	5,500.0	917,000	917,000	908,335	Do.
Talavera River	Nueva Ecija	8,000.0	1,050,000	1,108,000	1,020,026	90 per cent completed.
Tagudin River	Ilocos Sur	1,500.0	350,000	375,000	314,869	90 per cent completed.
Amburayan River	La Union	4,500.0	950,000	1,074,000	824,566	80 per cent completed.
Angat River	Bulacan	25,000.0	4,500,000	4,250,000	3,000,830	80 per cent completed.
Lamao	Bataan	160.0	30,000	5,000	3,424	Abandoned.
Laoag-Vintar	Ilocos Norte	6,000.0	1,000,000	900,000	690,229	55 per cent completed.
Dipolog	Zamboanga	1,000.0	110,000	97,500	54,076	50 per cent completed.
Sibalom-San Jose	Antique	4,000.0	500,000	390,000	140,175	28 per cent completed.
O'Donnell River	Tarlac	4,500.0	380,000	280,000	....	Construction work started.
Peñaranda River	Nueva Ecija and Bulacan	18,000.0	2,250,000	847,340	....	Do.
Totals		85,801.8	13,288,000	11,486,840	8,199,530	



Sluice way and settling basin, Amburayan River Irrigation Project, La Union

Of the total allotment authorized to date amounting to ₱10,836,840, ₱8,217,340 has been provided from the twenty-million-peso bond issue authorized by Act 3013 and ₱2,619,500 from the current revenues of the Government.

Completed Project.—A description of completed projects will be found in previous annual reports of this Division. All of these projects with exception of the Trinidad and Naic are operated and maintained by the Division and pertinent data regarding same are given in this report under the heading of "Operation and maintenance."

Talavera River Irrigation Project.—The work of completing the remaining lateral canal structures on this project was abandoned in April, 1924, by Messrs. Agcaoili and De la Cantera, bondsmen for Contractor A. R. Eichler who had abandoned the work in May, 1923. Authority was immediately granted for completing this work by administration but an early rainy season interrupted the work during the latter part of May which means that the work will have to be completed during the dry season of 1925. An additional unit was opened under this project on July 15, 1924, increasing the total area irrigated to 5,151.58 hectares. The entire area was planted to rice during 1924 and an excellent crop reported but figures on the actual yield are not as yet available.

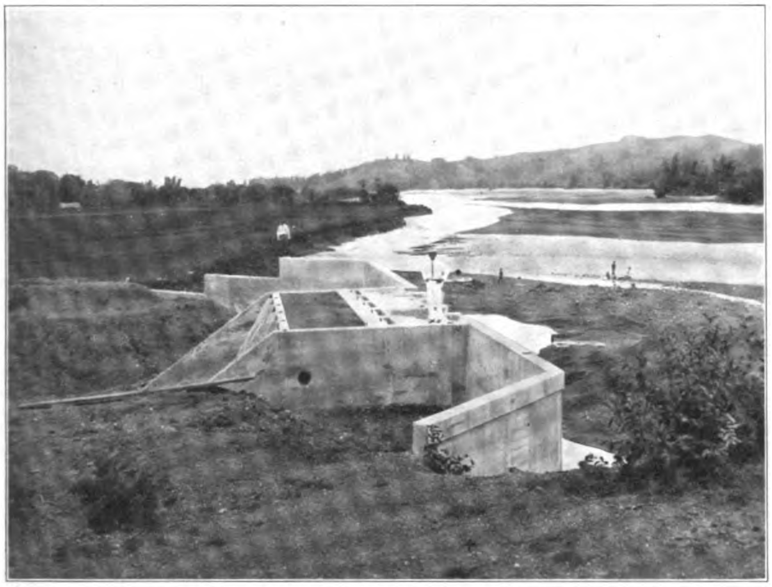
Tagudin Irrigation Project, Ilocos Sur.—This project would have been completed before the rainy season of 1924 but for interruption to construction work caused by the delay in releasing funds. The changes made in the plans for flume structures necessitating the preparation of new plans, have also contributed to some delay in completing the project. A total of 830 lineal meters of the 1,320 meters diversion tunnel has been lined, 600 meters of lining having been placed during 1924. The project is 90 per cent completed and it is expected to have it officially opened on March 1, 1925. The system has been in practical operation since September 15, 1924, when there was imminent danger of losing the rice crop in that locality due to drought. Water was furnished to about two-thirds of the project or an area of approximately 1,000 hectares.

Amburayan River Irrigation Project.—The excavation of the main canal and laterals was about 80 per cent completed at the close of 1924. Of the large structures, there remain to be constructed four inverted siphons, two of which, are now under construction. In addition to the above structures, there remain some 42 structures, such as lateral headgates, spillways, pipe culverts, drops and turnouts which can be completed before the end of the 1925 dry season. It is proposed to furnish water for the entire area covered by this project for the next rice crop.

Angat River Irrigation Project.—The contractor for the diversion works made very satisfactory progress during the past year. The headworks including the scouring sluices on both sides of the river have been completed. The main section of the weir is complete to elevation 12 for the entire length, and about 250 lineal meters of the weir's full section is completed. The block system in the apron of the weir is complete for 300 lineal meters. It may be said, therefore, that the entire structure is now 80 per cent complete and it is believed, that the diversion works as a whole should be completed not later than May 15, 1925. The excavation of the south side canal system has been completed since the end of 1923, with the exception of a few sublaterals which were not included in the original contract and will have to be excavated during the present dry season. The contractor for the south side canal structures made very slow progress but this work should be completed in time to deliver water for the next rice planting season. The lot survey is practically completed and it is planned to officially open the south side system on or before July 1, 1925.

The excavation of the north side canal system and the construction of the protection dyke on the south side was awarded to Contractor Carlos Baretto in February, 1924. Very satisfactory progress was made on this work. The lateral canals and main canal below kilometer 8 are about 75 per cent completed. If the contractor keeps up the same rate of progress as heretofore, this work should be completed before the end of the present dry season. The contract for the north side canal structures was awarded in December to Messrs. Gordon and Haley. The contract time is 500 days.

Laoag-Vintar Irrigation Project.—The excavation of the canal system was 78 per cent completed at the end of 1924. This work should have been completed in June, 1924, but in view of the changes made in the location of canals and difficulties encountered by the contractor in securing sufficient laborers, an extension of time was granted for completing his contract to April 30, 1925. Messrs. Gordon and Haley, contractors for the diversion works and main canal structures, have completed about 35 per cent of the work covered by their contract. In case their work is completed on contract time, water can be delivered to most of the land under the project for the next rice crop as the lateral canal structures are about 80 per cent completed.



General view of the headgates, Sibalom River Irrigation Project, Antique

Dipolog Irrigation Project.—This project was originally a municipal project but due to the inability of the municipality to finance its completion, authority was granted to complete it as an Insular project in December, 1923. Construction work, however, could not be resumed until recently as it was necessary to make additional topographic survey and after two years re-locate the canal system. Construction work is being done by administration since no bids were received from contractors.

Sibalom-San Jose Irrigation Project.—The excavation of the canal system, which is being done under contract was 52 per cent completed at the end of the year. The contract time expired on June 3, 1924, but an extension of time was granted the contractor to May 31, 1925 in view of the delays incident to securing right-of-ways and difficulties encountered by the contractor in securing laborers.

The contractor for the canal structures is making fairly satisfactory progress and barring unforseen circumstances, his work should be completed on contract time which will make it possible to deliver water for the next rice crop.

San Miguel Extension Project.—While the construction of this project was approved in 1923, funds were not released until November, 1924. Plans and specifications have been prepared and the work advertised. Construction work can be started at an early date and it is believed that same should be completed during 1925.

Peñaranda River Irrigation Project.—The project was also approved for construction in 1923, but no funds were provided for starting construction work until November, 1924. The necessary plans and specifications have been prepared for the excavation of the canal system and for the construction of the diversion works and this work advertised. Bids are to be opened early next year and, if sufficient funds can be made available when required, this project should be completed in June, 1927.

OPERATION AND MAINTENANCE

The following table gives pertinent information regarding completed Insular irrigation systems which are operated and maintained under the supervision of the Division in accordance with the provisions of the Irrigation Act:

System	Province	Cost of construction	Irrigable area	Annual installment per hectare	Cost of operation and maintenance 1924	Total charges per hectare 1924	Construction work completed
			Hectares				
Pilar	Bataan	₱27,606.70	174.00	₱8.65	₱968.95	14.50	1912
San Miguel	Tarlac	1,089,000.00	4,000.00		17,916.45	6.00	1913
Trinidad	Benguet	40,000.00	200.00		(a)		1921
Santa Barbara	Iloilo	692,000.00	4,945.56	7.01	10,639.98	9.34	1922
Dingras	Ilocos Norte	130,000.00	1,009.47	6.50	3,341.43	10.00	1922
Baruyen River	do.	89,000.00	810.69	5.55	825.31	6.70	1923
Naic	Cavite	292,000.00	675.97	21.82	(b)		1923
Talavera River	Nueva Ecija	1,050,000.00	1,169.04	[d]2.50		[d]2.50	1923
Do	do.	(c)	3,981.04	6.02	2,870.75	9.45	1924
Aganao River	Iloilo	917,000.00	5,500.00	8.42	17,435.00	11.65	1924

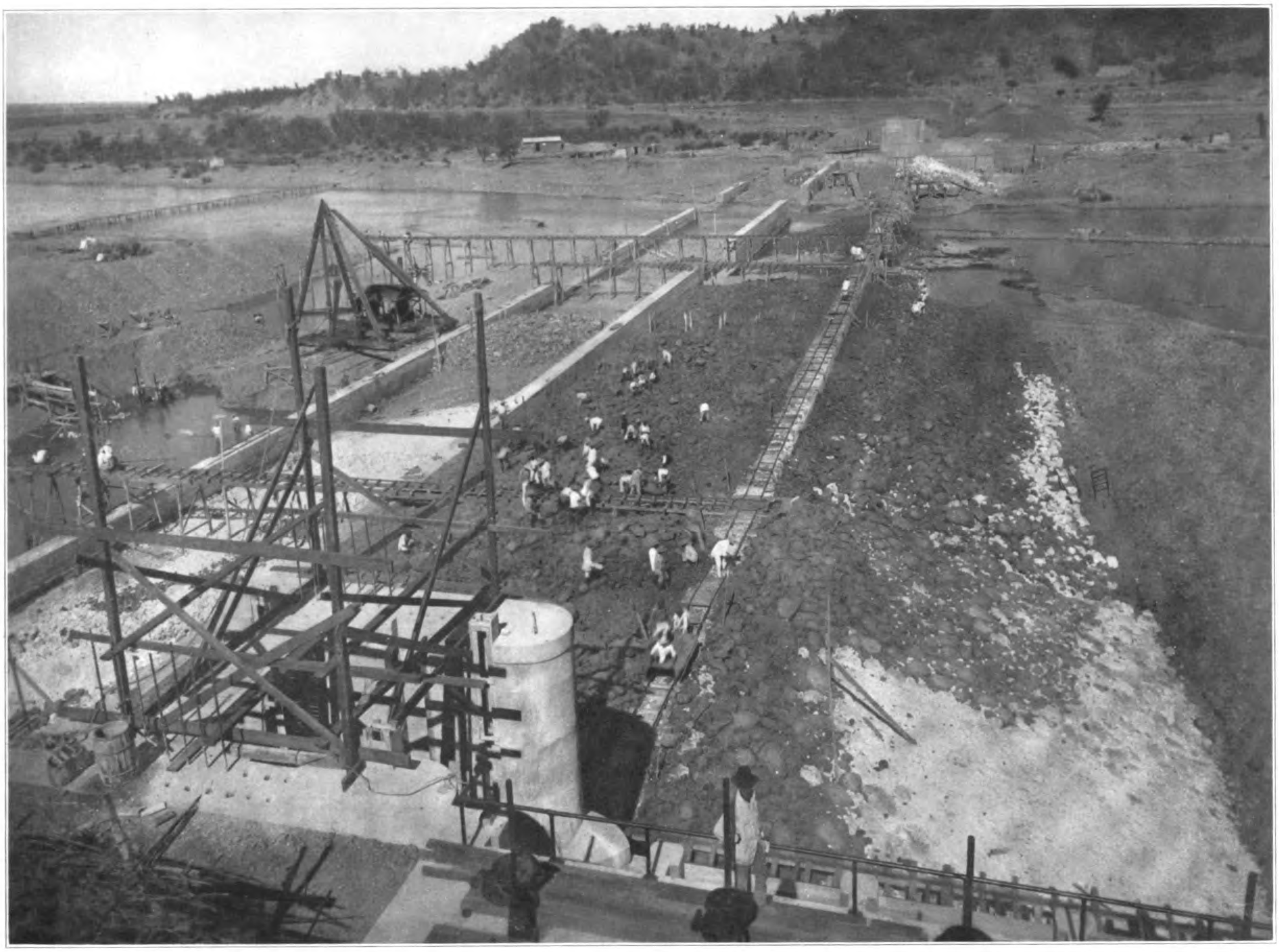
[a] System operated and maintained by the Superintendent, Trinidad Farm School.
[b] System operated and maintained by the Bureau of Lands.
[c] Area under completed portion of system.
[d] Charge of ₱2.50 is for 1,171.53 hectares of land formerly served by an old irrigation system from the Talavera River.

MUNICIPAL IRRIGATION PROJECTS

The following is a list of municipal irrigation projects recommended for construction since the passage of Act 2755:

Project	Province	Irrigable area	Estimated cost	Appropriations		Remarks
				Insular	Municipal	
		Hectares				
Santa Maria	Zamboanga	431	₱23,000	₱16,000	₱7,000	Completed, 1920.
Ayala	do.	183	17,000	11,500	5,500	Completed, 1922.
Pililla	Rizal	180	20,000			Construction recommended in 1919.
Morong	do.	580	30,000			Do.
Balaoan	La Union	1,400	80,000			Do.
San Fabian	Pangasinan	4,000	60,000			Do.
Mangatarem	do.	2,000	45,000			Do.
Candon	Ilocos Sur	1,000	78,000			Construction recommended in 1923.
Total		9,774				

All projects on which construction work is pending contemplate the improvement and extension of existing systems. Preliminary plans have been prepared and construction work may be undertaken when funds are provided.



General view of the Vintar weir under construction, Laoag-Vintar Irrigation Project, Ilocos Norte

IRRIGATION PROJECTS UNDER CONSIDERATION

The following list gives the location, approximate irrigable area and status of important irrigation projects under consideration:

Province	Project	Irrigable area	Status
		Hectares	
Albay	Quinali-Lake Bato	6,000	Awaiting investigation.
Do.	Malinao-Tabaco	600	Do.
Camarines Norte	Daet	2,000	Topographic survey completed.
Do	Talisay-Indan	3,000	Do.
Camarines Sur	San Jose-Hagonoy	5,000	Awaiting investigation.
Do.	Pauili Valley	5,000	Topographic survey completed.
Do	Barit River	2,000	Awaiting investigation.
Bataan	Dinalupijan	2,500	Do.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
Do.	Mambusao	1,000	Preliminary investigation, 1911.
Do.	Macato-Malinao	1,200	Do.
Do.	Ibahay	500	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Investigation in progress.
Ilocos Sur	Abra River	10,000	Preliminary survey completed, 1909.
Do.	Candon	1,000	Recommended for construction, Act 2755.
Do.	Santa Cruz	1,000	Preliminary survey completed.
Casupitan River	Santa Lucia and Candon	1,900	Recommended for construction, Act 2753.
Cebu	Balamban River	1,200	Awaiting investigation.
Batangas	Batangas	1,000	Investigation in progress.
Do	Balayan	300	Do.
Do	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Topographic survey completed.
Do	Pototan	2,300	Survey and preliminary design made.
Do	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Topographic survey completed.
La Union	Balaoan	1,200	Abandoned.
La Union	Bacnotan	2,000	Topographic survey completed.
Do	Agoo-Tubao	2,000	Awaiting investigation.
Do	Naguilian	1,000	Preliminary survey completed.
Do	Rosario	1,000	Topographic survey completed.
Do	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	1,000	Topographic survey completed.
Do	Palo	1,000	Preliminary investigation completed.
Do	Dagami-Tanauan	14,000	Awaiting investigation.
Do	Dato-Hilongos	3,500	Do.
Mindoro	Bucayao River	2,000	Do.
Nueva Ecija	Pampanga River	25,000	Topographic survey completed.
Nueva Vizcaya	Murong	1,200	Do.
Occidental Negros	Binalbagan-Himamaylan	3,000	Do.
Do	Bago	20,000	Do.
Do	Silay project	5,000	Awaiting investigation.
Oriental Negros	La Granja Extension Station.	200	Investigation in progress.
Do	Tanjay	800	Awaiting investigation.
Do	Tolong	3,000	Preliminary investigation made.
Pampanga	Porac	1,000	Topographic survey completed.
Do	Bamban	3,000	Do.
Do	Gumain	5,000	Do.
Pangasinan	Agno	40,000	Topographic survey completed.
Do.	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do	San Fabian	4,000	Do.
Do	Banila	5,000	Topographic survey completed.
Rizal	Mariquina Valley	5,000	Do.
Do	Pililla	180	Recommended for construction, Act 2755.
Do	Morong	590	Do.
Tarlac	Tarlac	25,000	Topographic survey in progress.
Zambales	San Marcelino	4,000	Topographic survey completed.
Do	Toton-Lanom	600	Preliminary survey completed.
Do	Iba	400	Do.
Total		299,130	

Topographic surveys were completed during 1924 of the Agno River and Banila River projects in Pangasinan, and the south side Bago River project in Occidental Negros covering a total area of over 64,000 hectares. Survey work was in progress at the end of the year, with survey parties in the field, on the Tarlac River project in Tarlac, and the San Nicolas project in Ilocos Norte.

Program for the construction of insular irrigation projects

Project	Province	Irrigable area	Estimated cost	Remarks
		Hectares		
Murong	Nueva Vizcaya	1,500	₱130,000	
Santo Tomas River	Zambales	4,000	450,000	Construction recommended, 1924.
Barugo	Leyte	1,000	200,000	Do.
Agno River	Pangasinan	30,000	5,000,000	Do.
Pampanga River	Nueva Ecija	25,000	3,000,000	
Pañgiplan River	Occidental Negros	3,000	400,000	
Bacnotan	La Union	2,000	200,000	
Santa Cruz River	Laguna	5,000	650,000	
Daet–Talisay	Camarines Norte	4,000	500,000	
Total		75,500	10,530,000	

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the Division made 1,849 discharge measurements at permanent gaging stations, and 28 measurements at temporary stations during 1924. Nine gaging stations were abandoned and 14 new stations established, leaving 162 permanent stations at the end of the year where daily gage height records are kept and frequent discharge measurement taken. Records were also kept for 20 rain gages established in localities distant from the Weather Bureau's gages.

The hydrographic data collected during the years 1908–1922 have been printed in four volumes known as "Surface Water Supply Bulletin No. 1." One thousand copies are now available for distribution.

WATER RIGHTS

There were received during the year a total of 220 new applications for water rights, 214 of which were for irrigation, and six for power development purposes. A total of 167 applications were finally acted upon, 146 of which were granted, and 21 disapproved by the Honorable, the Secretary of Commerce and Communications upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 11,950.72 hectares of land which is some 5,600 hectares more than covered by applications received during the preceding year. There were 15 applications for power development approved for developing a maximum of 510 horse power. There are four streams which were designed for adjudication during the year 1924.

Surveys were completed in March showing all water rights locations on five streams. The surveys covered 24,411.62 hectares of irrigated lands, or an increase of some 7,200 hectares over the work of the preceding year. The streams which have been surveyed and are now pending adjudication are given in the following table:

Stream	Province	Number of diversion ditches	Length of main canal in meters	Number of municipalities affected	Approximate number of hectares irrigated
O'Donnell–Moriones and Tarlac Rivers.	Tarlac	2	4,000	4	10,000.0000
Ange and Gogo Rivers	Pampanga	25	970	4	5,200.0000
Porac River	do	14	12,825	4	2,325.8676
Gumain River	do	7	27,236	4	2,820.4230
Caluman River	Pampanga and Bataan.	3	31,643	4	4,065.3270
Total					24,411.6176

Surveys are in progress, with surveying parties in the field, on the following streams:

Stream	Province	Municipalities affected	Approximate area of land irrigated in hectares
Banila River	Pangasinan	Rosales, Balungao, Umingan, and Santa Maria.	2,000
Andulan or Burubor River.	do	Balungao and Rosales	1,000
Bued or Nantayangan River.	Nueva Ecija and Pangasinan.	Cuyapo, Nueva Ecija, Rosales, Pangasinan.	1,500
Parasapas Creek	Pangasinan	Tayug and Natividad	300
Paoay Lake	Ilocos Norte	Paoay and Batac	500
Total			5,300

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream	Province	Municipalities affected	Approximate area of land irrigated in hectares
Lubnao Estero	Ilocos Norte	Sarrat	300
Burnay River	do	Solsona and Dingras	1,500
Nagdesaagan River	do	Piddig	800
Maoguing-oguing River	do	Dingras	500
Padaan River	do	Banna	1,900
Nagubuuban Estero	do	Badoc	300
Nasisi River	Albay	Ligao and Oas	1,000
Ynarihan River	Camarines Norte	Naga, Magarao, and Cabalanga	1,200
Banglayan River	Ilocos Sur	Narvacan	2,200
Codoog or Barangabong River.	do	Narvacan and Nagbukel	1,000
Matictic Creek	Nueva Ecija	Bongabon	400
Malabago or Anondaan River.	Pangasinan	Malasiqui, San Carlos, Calasiao, and Santa Barbara.	1,000
Maolo River	do	Sison and Pozorrubio	2,500
Gogo and Buge Esteros.	Tarlac	Concepcion	1,800
Pias Estero	do	Moncada and San Manuel	500
Canpuclo River	Tayabas	Candelaria	500
Immanduyan or Aloragat River.	Pangasinan	Mapandan, Manaoag, Binalonan, Pozorrubio, and Sison.	1,000
Parua River	Pampanga and Tarlac.	Mabalacat, Banban, and Concepcion.	5,000
Del Carmen Creek	Pampanga	San Fernando and Mexico	1,000
Matua Creek	do	Santa Rita, Guagua, and Bacolor.	800
Total			24,400

RIVER CONTROL PROJECTS

The Division had under consideration during the past year 30 river control projects as shown in the following table. The work of the Division on these projects was confined to field investigation and the preparation of plans and estimates. Construction work was carried out under the supervision of the district engineers.

RIVER CONTROL PROJECTS

Province	Municipality	River	Type of work	Estimated cost or funds avilable	Status
Albay	Libon	Calacran	Channel diversion		Preliminary plans.
Do	Guinobatan	San Francisco	Bank revetment	₱9,300.00	Do.
Antique	Barbara	Binangbang	do		Preliminary investigations.
Do	Calasi	Bacong	Channel diversion	40,000.00	Preliminary investigations and plans.
Do	Tibiao	Tibiao	Protection against inundation and scouring		Preliminary report.
Batangas	Balayan	Binambang.	Earth dykes	23,000.00	Earth fill placed with ₱16,000 allotment. Protective paving to be placed.
Camarines Sur	Goa	Langas	Improvement of channel		Preliminary studies.
Cebu	Danao	Danao	Earth dyke	4,000.00	Awaiting construction.
Iloilo	Cabatuan	Cabatuan	Bank revetment	8,000.00	Do.
Do	Dumangas	Dumangas	Channel Improvement and bank revetment		Preliminary studies.
Do	Igbaras	Igbaras	Bank revetment	25,000.00	Awaiting construction.
Do	La Paz	La Paz	Earth dyke	20,000.00	Under construction.
Ilocos Norte	Badoc	Badoc			Under investigation.
Do	Soisona	Solsona			Do.
Do	Vintar	Vintar	Bank revetment		Preliminary studies.
Leyte	Alang-alang	Mainit	do		To be financed with road funds.
Do	Barugo	Minusuang	Improvement of channel		Preliminary studies.
Occidental Negros	Binalbagan	Binalbagan	Channel diversion and dyke		Preliminary plans.
Do	Cadiz	Cadiz	Bank revetment and jetty		Preliminary report.
Do	Ilog	Ilog	Bank revetment and dyke		Do.

RIVER CONTROL PROJECTS—continued

Province	Municipality	River	Type of work	Estimated cost or funds available	Status
Pampanga	Santa Rita, Betis, Bacolor, and Guagua.	Potrero or Pasig	Channel diversion		Topographic survey completed. Work done under the district engineer.
Do.	Arayat, San Luis, San Simon, and Apalit.	Pampanga	Maintenance and improvement of existing dyke on right bank revetment.	₱25,000.00	
Do.	Sexmoan	Pasag			Preliminary investigations.
Pangasinan	Asingan	Agno	Earth dyke	50,000.00	Completed.
Do.	Bayambang	....do.	Earth dyke and cut-off channel	50,000.00	Do.
Do.	Rosales	Banila	Channel diversion	100,000.00	Awaiting construction.
Samar	Catarman	Catarman	Repairs to existing spur dykes	12,000.00	Under way.
Tarlac	Tarlac	Tarlac	Construction of apron for Tarlac dyke paving.	2,000.00	Do.
Do.	San Miguel	O'Donnell	Protection of dykes	2,000.00	Completed.
Tayabas	Sariaya	Lagnas and Sariaya	Channel diversion and improvement	5,000.00	Under constructions.

WATERWORKS AND SEWERAGE SYSTEMS

The Division prepared plans and specifications for 10 municipal waterworks projects on which construction work was started during 1924. These projects will furnish potable water to a total population of 40,080 at an estimated cost of ₱522,450. Preliminary designs and estimates were also made for 23 provincial and municipal waterworks projects, most of which are to be financed from loans. These projects will supply 51,830 people at an estimated cost of ₱587,600.

Construction work was completed by district engineers on 9 waterworks projects started during previous years, leaving 35 projects under construction at the end of the year. The 9 completed projects cost ₱572,004.88 and serve a total population of 38,000 while the 35 projects still under way are estimated to cost ₱1,536,940, and will provide a potable water supply for 115,000 people.

There are 101 waterworks projects under consideration which contemplate furnishing water to a total population of 378,400 and are estimated to cost approximately ₱6,000,000. As soon as the municipalities concerned are able to finance these projects, construction work may be undertaken, excepting a few projects which require further investigation.

There are 122 municipal and provincial waterworks projects, excluding the Manila Metropolitan Water System thus far completed which provide potable water to a total population of 378,381 and have cost ₱4,481,118.66.

Osmeña Waterworks System.—Plans and estimates were prepared by the Division for the construction of piers over the spillway of the Buhisan reservoir and a platform for operating three 4.57 x 4 meters sluice gates. The purpose of this work is to increase the storage capacity of the reservoir by 130,000,000 gallons by raising the crest of the spillway from Elev. 103 to Elev. 107.2 meters, and thus meet the yearly shortage of water during the dry season. The amount of ₱40,000 was made available and placed at the disposal of the Director of Public Works by the Cebu Board of Waterworks Commissioners. Work on the piers and operating platform is being done by Messrs. Regner and Gandiongco, contractors of Cebu, and will be completed early in 1925.

The Bureau of Science conducted an investigation to determine the cause of the objectionable odor of the Cebu Reservoir water. This investigation disclosed the fact that the odor is the result of the decomposition of nitella and that treating the water with copper sulphate would probably exterminate these organisms.

Lucena Storm Water Drain System.—Plans and estimates were prepared by this Division for the construction of a Storm Water Drain System for the town of Lucena, Tayabas, at an estimated cost of ₱110,000. The municipality appropriated the sum of ₱51,000 for this purpose last year. Construction work was started in August and is now well under way. Insular aid in the amount of ₱25,000 has been granted this project, and with a like appropriation by the municipality of Lucena the project can be completed during 1925.

The status of all waterworks projects to date is shown in the accompanying lists as follows:

Table I.—Waterworks projects under construction.

Table II.—Waterworks projects completed.

Table III.—Waterworks projects under consideration.

TABLE I.—*Waterworks projects under construction*

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Batangas	Bauan	Pumping	4,700	₱65,000.00	₱40,000.00	₱20,000.00
Do.	Tanawan	Gravity	2,500	57,000.00	37,000.00	20,000.00
Bohol	Loon	....do.	5,000	33,000.00	22,000.00	11,000.00
Bulacan	Malolos	Pumping	6,000	140,000.00	50,000.00	26,500.00
Cavite	Cavite	....do.	10,910	90,000.00	49,000.00	37,500.00
Do.	Indang	....do.	3,000	42,000.00	22,000.00	11,213.00
Do.	Silang	Gravity	4,000	50,000.00	20,000.00	11,800.00
Cebu	Carcar (Improvement)	....do.	4,000	48,000.00	12,000.00	6,000.00
Do.	Dalaguete Extension	....do.	3,500	38,000.00	5,000.00	9,000.24
Do.	Malabuyoc Extension [a]	....do.		6,000.00	2,000.00	1,257.28
Do.	Barrio San Isidro, San Francisco [a]	....do.	650	1,950.00	1,300.00	650.00
Laguna	Alaminos [a]	....do.	1,130	30,000.00	20,000.00	10,000.00
Do.	Calamba [a]	Pumping	7,000	85,000.00	25,000.00	12,500.00
Do.	Magdalena	Gravity	3,000	68,000.00	42,400.00	21,210.79
La Union	San Fernando [a]	....do.	5,000	83,000.00	24,000.00	32,000.00
Leyte	Baybay [a]	....do.	8,000	66,000.00	25,000.00	25,000.00
Mountain Province	Apayao (Kabuyao)	....do.	800	7,000.00	5,000.00	
Do.	Kiangan	....do.		7,000.00		6,643.40
Do.	Lubuagan	....do.	1,200	8,000.00	5,000.00	
Oriental Negros	Dumaguete	Pumping	4,000	84,990.00	54,200.00	27,101.93
Palawan	Bacuit	Gravity	1,000	3,200.00	2,500.00	700.00
Do.	Balabac Extension	....do.	800	5,000.00	3,200.00	
Do.	Barrio Bintuan	....do.	1,000	5,500.00	3,700.00	1,000.00
Do.	Culion	....do.	5,000	35,000.00	35,000.00	
Do.	Cuyo	Pumping	800	10,000.00	6,650.00	3,000.00
Do.	Oton	Gravity	330	5,000.00	3,000.00	
Do.	Puerto Princesa (Reconstruction)	Pumping	400	3,300.00	2,200.00	
Pampanga	Arayat	Gravity	3,840	42,000.00	22,800.00	11,400.00
Pangasinan	Lingayen [a]	Pumping	7,000	93,000.00	15,000.00	60,500.00
Sorsogon	Sorsogon [a]	Gravity	6,000	66,000.00	25,000.00	23,333.33
Tarlac	Moncada	....do.	3,000	24,000.00	16,000.00	8,000.00
Tayabas	Candelaria [a]	....do.	3,500	52,500.00	20,000.00	10,000.00
Do.	Pagbilao	....do.	2,300	67,500.00	45,000.00	22,500.00
Do.	Tiaong [a]	....do.	1,800	39,000.00	14,750.00	15,000.00
Zambales	San Antonio	....do.	4,000	75,000.00	25,000.00	(b)
Total			115,160	1,535,940.00	700,700.00	44,809.97

[a] Projects was begun in 1923.

[b] One-third cost guaranteed by municipal council and provincial board.

TABLE II.—*Waterworks projects completed*

Province	Municipality	Population served	Cost	System	Capacity of system. Gallons per day
Abra	Bangued [a]	6,600	₱129,688.70	Gravity	180,000
Albay	U.S. Reservation Regan Barracks, Albay and Legaspi.	5,000	60,000.00	Crude oil and steam pumping.	259,200
Antique	San Jose	4,000	41,846.74	Pumping	47,520
Batangas	Balayan	2,000	7,353.92	Gravity	100,800
Do	Batangas	6,147	71,529.96	Pumping	144,000
Do	Cuenca	2,500	5,000.00	Gravity	5,040
Do	Lemery [a]	7,200	47,132.84	Pumping	200,000
Do	Lipa	5,000	103,065.87	do	172,800
Do	San Jose	4,000	44,099.45	Gravity	216,000
Do	Santo Tomas (Kalaw).	1,910	27,108.65	do	50,400
Do	Taal	5,000	91,188.34	Pumping	187,200
Do	Taal Extension [a]	4,000	57,220.41	do	80,000
Bohol	Dauis	840	5,100.00	Gravity	77,760
Do	Duero	2,000	10,823.56	do	86,400
Do	Jagna	3,000	24,115.26	do	43,200
Do	Loay	3,000	18,968.72	do	144,000
Do	Mabini	1,300	6,750.00	do	72,000
Do	Tagbilaran	5,245	13,837.47	Pumping	77,760
Do	Tubigon	4,800	37,094.06	do	100,800
Bukidnon	Deliric	600		Gravity	4,320
Do	Malaybalay	1,300	11,641.16	do	20,160
Do	San Luis	500	650.00	do	
Bulacan	Marilao	(b)	22,101.50	Gravity	
Do	Hagonoy	2,789	7,564.87	do	50,400
Do	Sibul, S. Miguel	(c)	256,000.00	do	
Camarines Norte	Mambulao	No data	1,200.00	do	
Capiz	Capiz	6,400	13,541.92	Concrete tank.	[e] 264,170
Cavite	Mendez-Nuñez	1,600	60,700.00	Water wheel driven pump.	57,600
Cebu	Barili	2,067	26,958.25	Gravity	61,200
Do	Carcar	4,463	64,004.45	do	216,000
Do	Catmon	1,624	16,399.56	Pumping	
Do	Cebu	65,000	510,640.13	Gravity	806,400
Do	Cebu-Labangon	(d)	16,000.00	do	576,000
Do	Cebu-Sambag	(d)	35,789.18	Pumping	187,200
Do	Cordova	1,191	4,810.74	Rain tank	[e] 30,000
Do	Daanbantayan	579	5,672.99	do	30,000
Do	Dalaguete	2,480	14,941.15	Pumping	36,000
Do	Dumanjug	1,500	35,638.29	do	187,200
Do	Ginatilan	2,669	13,404.80	Gravity	43,200
Do	Malabuyoc	1,500	14,941.15	do	104,544
Do	Moalboal	2,108	14,297.27	Gravity	54,720
Do	Opon			Pumping	144,000
Do	Oslob Barrio				
Do	Mainit		2,000.00	Gravity	
Do	Pilar	702	5,019.21	do	14,400
Do	Poro	1,000	8,873.73	do	21,600
Do	Naga	3,233	6,800.00	do	79,200
Do	Naga Extension	(b)	4,552.48	do	
Do	Samboan	2,741	7,514.11	do	49,248
Do	San Francisco	1,243	6,200.00	do	10,000
Do	Sibonga	2,661	35,300.00	do	63,360
Do	Tuburan	3,900	55,355 55	do	120,960
Do	Tudela	851	8,263.29	do	24,480
Cotabato	Parang	600	9,600.00	Hydraulic ram.	21,600
Davao	Davao	6,000	137,195.14	Gravity	86,400
Ilocos Sur	Vigan	8,440	127,399.52	do	201,600
Isabela	Ilagan	(c)	(f)	do	
Laguna	Bay	1,471	2,767.72	do	86,400
Do	San Pablo	7,000	89,455.82	do	576,000
Do	Santa Cruz	6,000	92,692.43	Pumping	352,800
Do	Majayjay	3,200	38,686.06	Gravity	187,200
Do	Nagcarlang	2,500	36,034.42	do	180,000
Do	Pagsanjan	4,044	73,782.67	Pumping	233,280
Marinduque	Boac	1,000	6,653.00	do	57,600
Do	Gasan	1,400	22,124.97	do	144,000
Do	Malbog	1,000	13,614.29	Gravity	61,920
Do	Mogpog	1,280	10,535.69	do	18,288
Do	Santa Cruz	2,560	20,696.23	do	158,400
Mindoro	Abra de Ilog	350	4,743.74	do	14,400
Do	Calapan	2,500	29,743.47	Pumping	57,600
Misamis	Baliñgasag	1,514	8,924.14	Gravity	57,600
Do	Cagayan	3,000	50,408.82	Pumping	86,400
Do	Mahinog	5,727	6,000.00	Gravity	
Do	Mambajao	14,446	30,000.00	do	
Do	Sagay	6,321	800.00	do	
Mountain Province	Baguio [a]	6,000	180,428.50	Pumping and Gravity.	350,000
Do	Cervantes	800	7,565.07	Gravity	
Do	Teachers' Camp and Country Club.	1,500	(g)	do	216,000
Do	Mansion house	100	(g)	Pumping	
Do	Trinidad Farm School.	300	19,330.93	Gravity	36,000
Do	Trinidad Stock Farm.	60	2,000.00	do	
Nueva Ecija	Cabanatuan [a]	6,000	111,302.49	Pumping	100,000
Oriental Negros	Basac	365	(h)	Hydraulic ram.	
Do	Barrio Siquijor	494			
Do	Talingting Larena.	2,890	5,025.00	Gravity	6,480
Do	Lazi	2,300	6,980.77	do	
Do	Luzuriaga	2,500	12,317.44	do	269,280
Do	Maria	1,000	1,353.05	do	
Oriental Negros	Maria Extension.[a]	(i)	₱2,677.41	Gravity	7,400
Do	Siquijor, Poblacion.	1,587	18,000.00	do	
Palawan	Coron	1,150	7,844.63	Pumping	20,160
Do	Puerto Princesa	716	10,268.45	do	28,800
Pampanga	Angeles	6,708	12,318.52	Steam Pump.	61,920
Do	San Fernando	1,000	1,050.02	Pumping	86,400
Pangasinan	Alcala [a]	2,200	3,000.00	Gravity	129,600
Do	Bani	2,000	12,411.86	do	86,400
Do	Bayambang	2,400	8,652.80	do	108,000
Do	Dagupan	(d)	2,823.02	do	
Do	Lingayen	(d)	3,938.99	do	
Do	do	(e)	9,141.22	do	
Do	Mangaldan	(d)	635.53	do	122,400
Do	San Fabian	(d)	682.87	do	57,600
Rizal	Antipolo	2,250	23,299.07	Pumping	82,080
Do	Pasig	10,000	40,000.00	do	86,400
Romblon	Loboc [a]	2,000	26,246.59	Gravity	144,000
Do	Romblon	2,300	(f)	do	
Samar	Calbayog	(d)	(f)	Rain tank	[h] 20,000
Do	Catbalogan [a]	2,000	64,308.94	Gravity	55,000
Do	Oras	4,000	(f)	do	
Sorsogon	Bacon	3,200	21,000.00	do	79,200
Do	Magallanes	3,500	8,000.00	Pumping and gravity.	
Do	Sorsogon	250	1,044.67	Pumping	36,000
Sulu	Jolo	722	76,974.29	do	115,200
Surigao	Barrio Bacuag, Gigaquit.	2,405	7,500.00	Gravity	
Do	Lianga	1,290	1,924.58	do	2,880
Do	Placer	870	13,133.95	do	18,720
Tayabas	Lucban	3,200	50,205.60	do	316,800
Do	Lucena	7,500	234,390.57	do	432,000
Do	Mauban	3,500	57,209.32	Pumping	144,000
Do	Sariaya	6,000	37,935.00	Gravity	201,600
Do	Tayabas	4,600	125,159.26	do	432,000
Zambales	Subic	1,628	10,670.62	do	11,520
Zamboanga	Zamboanga	5,000	305,361.30	Gravity and Hydro-electric.	504,000
Total		378,381	4,481,118.66		

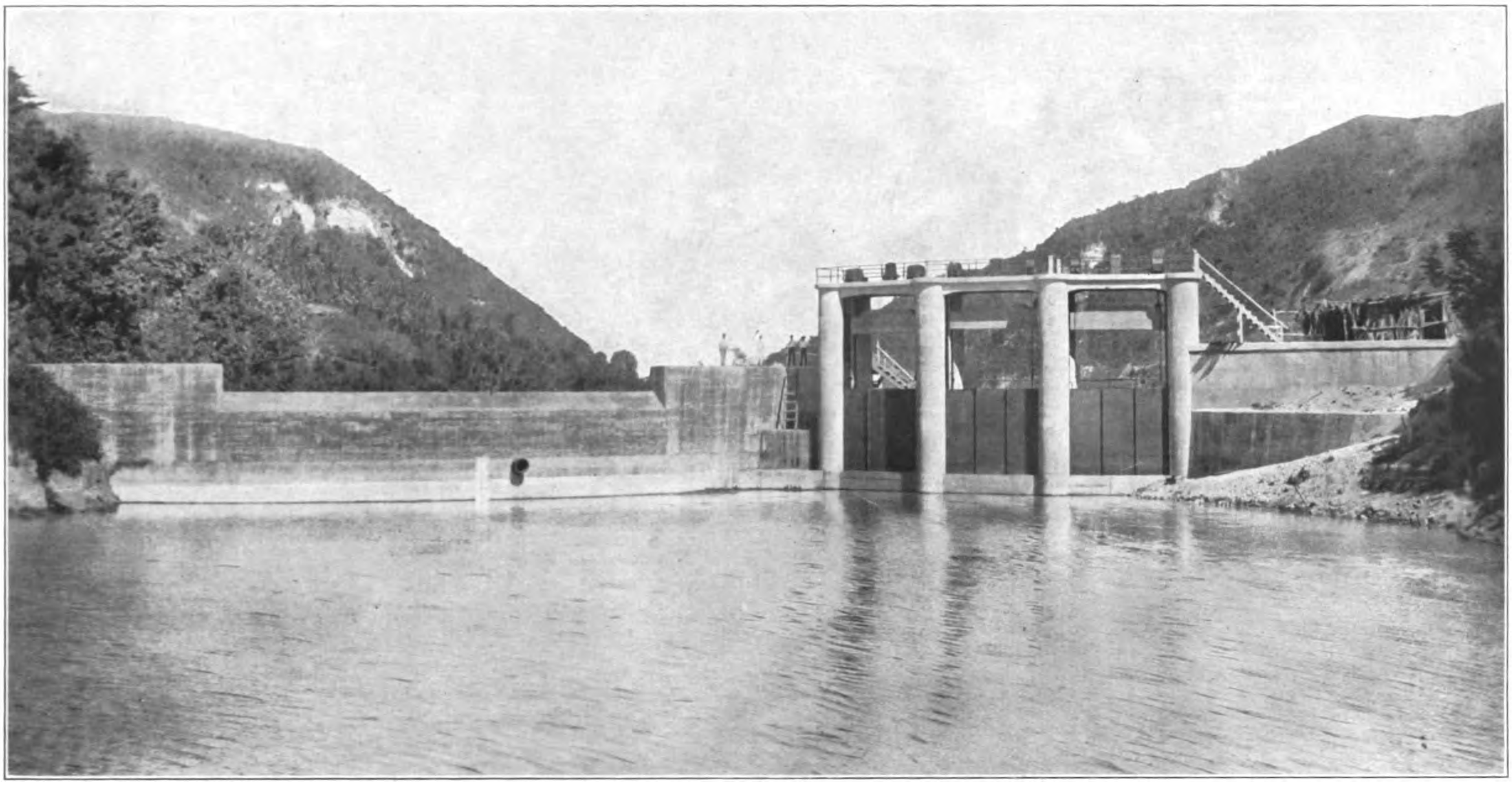
[a] Projects completed in 1924.
[b] Part of Naga.
[c] Constabulary tank.
[d] Market.
[e] School.
[f] No record.
[g] Not available.
[h] Gallon tank.

[a] Projects completed in 1924.
[d] Market.
[e] School.
[f] No record.
[h] Gallon tank.
i Part of Maria.

TABLE III.—*Waterworks projects under consideration*

Province	Municipality	Estimated cost	Population to be served	System
Albay	Camalig [a]	₱12,000.00	2,500	Gravity.
Do	Guinobatan	54,000.00	5,000	Do.
Do	Jovellar [a]	14,000.00	2,500	Do.
Do	Tabaco	45,000.00	2,500	Do.
Antique	Bugasong [a]	20,000.00	2,500	Do.
Do	San Jose Extension [a]	40,000.00	1,500	Pumping.
Batanes	Itbayat [a]	15,000.00	1,000	Gravity.
Do	Ivana	40,000.00	2,000	Do.
Do	Sabtang			No data.
Batangas	Balayan Extension	1,500.00	748	Gravity from Balayan tank.
Do	Rosario	18,000.00	5,000	Pumping.
Do	Talisay [a]	21,000.00	2,130	Gravity.
Bohol	Anda	22,000.00	2,500	Do.
Do	Calape	30,000.00	2,600	Do.
Do	Carmen	6,100.00	600	Do.
Do	Corella	6,000.00	1,019	Do.
Do	Dimiao [a]	12,000.00	1,500	Do.
Do	Garcia-Hernandez	21,500.00	2,000	Do.
Do	Inabanga	63,000.00	4,000	Do.
Do	Loay Extension	3,200.00	500	Do.
Do	Loboc	27,000.00	3,000	Do.
Do	Tagbilaran Improvement	31,000.00		Pumping.
Do	Valencia	20,000.00	1,435	Gravity.
Bukidnon	Impasugong	36,000.00	1,600	Do.
Bulacan	Pulilan	18,000.00	3,000	Do.
Do	San Ildefonso	45,000.00	2,500	Pumping.
Do	San Miguel	90,000.00	2,308	Do.
Cagayan	Aparri	346,000.00	9,195	Do.
Do	Camalaniugan		2,348	
Do	Lal-lo		1,382	
Do	Tuguegarao	201,000.00	12,000	Do.
Camarines Norte	Paracale [a]	9,000.00	2,500	Gravity.
Camarines Sur	Camaligan	300,000.00	14,000	Do.
Do	Canaman			
Do	Magarao			
Do	Naga			
Capiz	Panay	3,000.00		Rain tank.
Cebu	Alegria	19,000.00	1,000	Gravity.
Do	Asturias	27,000.00	1,086	Pumping.
Do	Argao	50,000.00	4,500	Gravity.
Do	Badian [a]	35,000.00	1,700	Do.
Do	Balamban	40,000.00	4,818	Do.
Do	Barili Extension [a]	8,600.00	300	Do.
Do	Dumanjug Extension	32,000.00	3,210	Gravity instead of pumping.

[a] Projects for which design and estimate were made in 1924.



Osmeña Waterworks Dam, Cebu, showing newly installed sluice gates and operating platform from above

TABLE III.—*Waterworks projects under consideration*—Continued

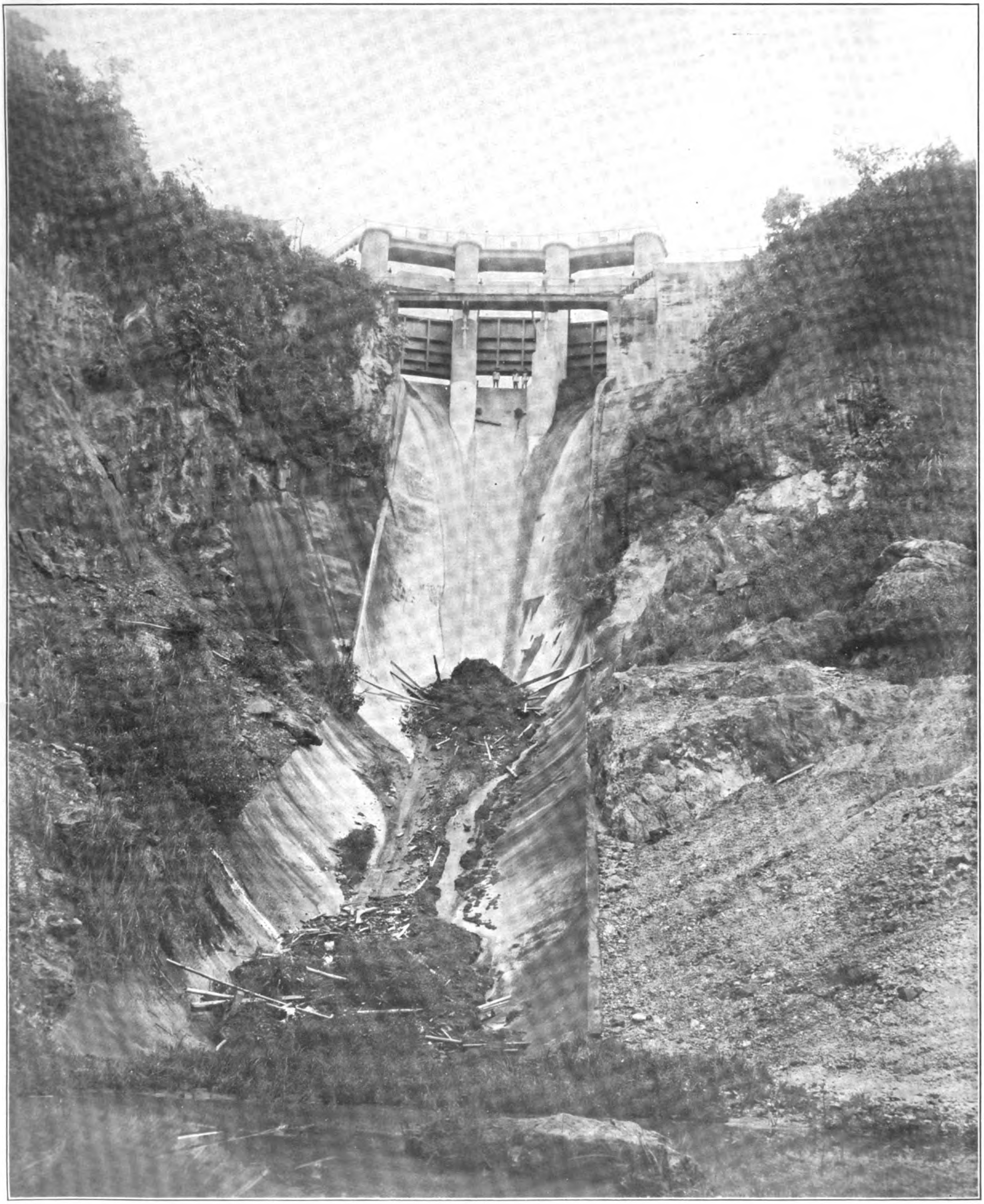
Province	Municipality	Estimated cost	Population to be served	System
Cebu	Mandaue	₱35,000.00	2,500	Gravity, Cebu Extension.
Do	Moalbual Extension	25,200.00	3,000	Do.
Do	Oslob	15,000.00	2,000	Do.
Do	Ronda	28,000.00	1,880	Do.
Do	San Fernando	30,000.00	3,050	Do
Do	San Francisco Improvement [a]	27,000.00		Do.
Do	Sogod	15,000.00	2,200	Do.
Do	Talisay	30,000.00	2,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Hydraulic Ram. and gravity.
Ilocos Norte	Laoag (Metropolitan)	880,000.00	25,000	Gravity.
Ilocos Sur	Bantay	15,000.00	2,500	Do.
Do	Caoayan	45,000.00	1,700	Do.
Do	Santa Lucia		1,908	No data.
Do	Santa	28,000.00	875	Gravity.
Iloilo	Iloilo Metropolitan	1,703,000.00	84,000	Do.
Do	Pototan-Dingle	279,000.00	9,200	Do.
Isabela	Ilagan		2,539	No data.
Laguna	Lilio	40,000.00	4,500	Gravity.
Do	Luisiana [a]	47,000.00	4,500	Do.
Do	Pila	60,000.00	2,171	Pumping.
Do	Rizal	27,000.00	3,000	Gravity.
Lanao	Dansalan		2,000	Hydro-electric.
Leyte	Burauen		3,038	No data.
Do	Liloan	10,000.00	700	Gravity.
Do	Maasin	15,000.00	3,300	Do.
Do	Tacloban		6,532	No data.
Marinduque	Torrijos	21,000.00	5,000	Gravity.
Mindoro	Bulalacao [a]	5,000.00	700	Do.
Do	Looc		1,623	No data.
Do	Caluya		1,477	Do.

[a] Projects for which design and estimate were made in 1924.

TABLE III.—*Waterworks projects under consideration*—Continued

Province	Municipality	Estimated cost	Population to be served	System
Misamis	Misamis	₱66,000.00	3,450	Pumping.
Oriental Negros	Dauin [a]	23,000.00	1,500	Gravity.
Do	Gihulngan [a]	21,000.00	3,500	Do.
Do	Manjuyod [a]	12,000.00	2,000	Do.
Do	San Juan, Siquijor [a]	21,000.00	2,000	Do.
Do	Vallehermoso [a]	21,000.00	2,500	Do.
Palawan	Cagayancillo		1,066	Rain water tank.
Do	Concepcion	3,600.00	600	Gravity.
Do	Coron Improvement	19,000.00		Do.
Pangasinan	Dagupan		4,436	No data.
Do	Malasiqui	30,000.00	2,613	Pumping.
Do	San Manuel	30,000.00	4,375	Gravity.
Rizal	Pasig Extension	27,000.00	5,200	Pumping.
Romblon	Despujol			No data.
Do	Odiongan			Do.
Samar	Calbayog		5,907	Do.
Do	Llorente	14,000.00	2,500	Pumping.
Do	Oras Improvement [a]	10,000.00		Gravity.
Sorsogon	Barcelona	25,000.00	4,000	Do.
Do	Gubat [a]	78,000.00	7.000	Do.
Surigao	Surigao	70,000.00	6,400	Do.
Tarlac	Tarlac	120,000.00	6,000	Pumping. Data incomplete.
Tayabas	Atimonan [a]	93,000.00	6,000	Gravity.
Do	Mulanay	27,000.00	1,200	Do.
Do	Sampaloc [a]	25,000.00	3,000	Do.
Do	San Narciso [a]	18,000.00	1,000	Do.
Total		6,001.700.00	378.419	

[a] Projects for which design and estimate were made in 1924.



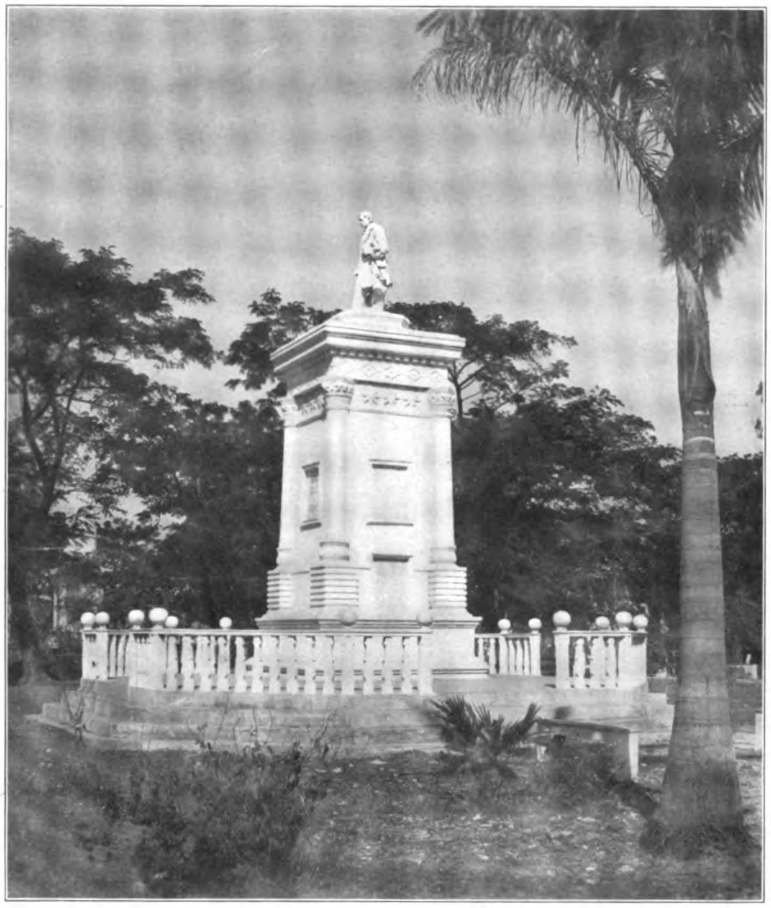
Osmeña Waterworks Dam, Cebu, showing newly installed sluice gates and operating platform from below

APPENDIX

PROJECTS ACTIVE, JANUARY 1, 1925

Provinces	Roads and trails				Bridges and culverts				Provincial administration buildings				Municipal administration buildings				Prisons			Schools				Construction and operation									Miscellaneous	Total
	Construction	Maintenance	Repair	Reconstruction	Construction	Maintenance	Repair	Reconstruction	Construction	Maintenance	Repair and alteration	Reconstruction	Construction	Maintenance	Repair and alteration	Reconstruction	Construction	Repair and alteration	Maintenance	Construction	Maintenance	Repair and alteration	Reconstruction	Markets and tiendas	Parks, ground and athletic fields	Miscellaneous buildings	Ferries	Water systems	Automobile lines	Quarries	Telephone lines	Electric light plant		
Abra	4	3	1		1															2								1			1		1	14
Agusan	3	3																															3	9
Albay	7	4		1						1			1							3	1	3		2		3							5	31
Antique	5	2																		1														8
Bataan	2	3			1						1		1							2								1					3	14
Batangas	7	3	1							2					1					4	3	2		1	2	1		3			1	2	24	57
Benguet	2	12			2						1			1						1	2			2	1	3		3				5	19	54
Bohol	5	3							1				3							4		2		1	1	4		3				1	5	32
Bukidnon	1	2																																3
Bulacan	4	3	1	2	3		2						2							4													6	27
Cagayan	1	2																		2		1				2	1	1			1		10	22
Camarines Norte	2	4										1																					3	10
Camarines Sur	3	5			1					1			1								2					2							3	18
Capiz	3	2																		1						1							3	11
Cavite	14	5		2	1															2								5					2	31
Cebu	3	3		1			1				1		1							4						5		2					6	27
Cotabato	5	3									1									4		1		2		4	1				2		10	33
Davao	4	4							1		1		2							1		1		1	1		4	1			1		18	40
Ilocos Norte	8	2			1															5				1	1								1	19
Ilocos Sur	3	3			2				1				1							4						1	1						3	19
Iloilo	8	2	1								2		1							4		3	1	1	1								10	34
Isabela	5	2			1				1		1									3							1						2	16
Laguna	6	3																		1								3					2	15
Lanao	2	3											1							1				1									6	14
La Union	3	5																1		6		2	1	1				1					1	21
Leyte	3	4		1					1				3							1						4					1		5	23
Manila																									1	31							60	92
Marinduque	2	2		1	3															1						2							1	12
Masbate	1	2		1																1				1									3	9
Mindoro	2	3			2					1			2							1	1		1								1		1	15
Misamis		3	1		1			1			1							1		4		1			1			1					4	19
Mountain Province		3											1															1					7	12
Nueva Ecija	9	5		2		1														7				2	1		1	2					7	37
Nueva Vizcaya	6	6																									1						4	17
Occidental Negros	8	2			2															2		3	1	1		1							2	22
Oriental Negros	6	5		1					1																			1					6	20
Palawan																																		
Pampanga	1	3		1	2								1							1		3		2	1	7		1					29	52
Pangasinan	12	3			5							1								9		1		1		4		2					6	44
Rizal	5	3											2				1			6				1	1								7	26
Romblon	1	1																		3		1						1					2	9
Samar	5	2			1								1							1				1		2		1					3	17
Sorsogon	3	3			2															4													4	16
Sulu	5	4																				5			1								20	35
Surigao	2	2									1									1													1	7
Tarlac	5	2											2											1				1						11
Tayabas	4	3		2	1						1									1				1	3			3					9	28
Zambales	3	2									1									4		1		1			1	1			1		1	16
Zamboanga	2	5									1									1						1		1					15	26
Total	195	154	5	15	32	1	3	1	6	5	13	2	26	1	2	0	1	2	0	107	9	30	4	25	16	78	11	40	0	0	9	8	450	1,144

NOTE.—Of the 450 projects under the caption "Miscellaneous," there are 23 wireless and radio stations, 39 surveys and investigations of roads, bridge sites, etc., 3 docks, 48 artesian wells, 6 port work maintenance, 1 harbor maintenance, 4 irrigation systems, 19 wharves, 11 river control projects, 2 customhouses, 1 dredging project, 9 dykes, 1 boundary monument, 28 constabulary buildings, 4 irrigation ditches, 5 water tanks, 26 hospitals, 1 dam, and 7 monuments.



Rizal Monument, Laoag, Ilocos Norte

BUREAU OF PUBLIC WORKS

◆

STAFF AND PERSONNEL

[Corrected to January 1, 1925]

A. D. WILLIAMS, *Director of Public Works*
MARCIAL KASILAG, *Chief Constructing Engineer*
[illegible] C. EARLE, *Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer*
TOMAS MAPUA, *Supervising Architect*
JUAN ARELLANO, *Supervising Architect*

CENTRAL OFFICE ORGANIZATION

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T. Camu, Cashier and Disbursing Officer.
Primo Villar, Law Clerk.
Filomeno Sta. Ana, Record Clerk.
Jose de Jesus, Property Clerk.
Salustiano Reyes, Superintendent of Automobiles.

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R. S. Clemons, E. and M. E.
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V. Gloria, Asst. C. E.
V. Villanueva, Asst. Electrical Engineer.
Ciriaco Coronel, Asst. E. and M. E.
Manuel Felizardo, Asst. M. E.
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Gonzalo T. Vales, C. E.
Teodato P. Macabulos, C. E.
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Frank F. Reynolds, Asst. Engineer.
Juan Altiveros, Architect.

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Vicente Fragante, Div. E., Fourth Division.
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Nicanor Cortes, Designing Engineer.
W. J. Lamon, Project Engineer.
Leon Ines, Project Engineer.
H. O. Bauman, Project Engineer.
Ricardo Nostratis, Project Engineer.
Gonzalo Garcia, Project Engineer.
Angel Martinez, Project Engineer.
Gaudioso Cruel, Acting Project Engineer.
Hilario Clemente, C. E.
Manuel Gonzalez, C. E.
Gregorio de Leon, C. E.
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Julian Buendia, C. E.
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Miguel Garcia, Asst. C. E.
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Ramon C. Caluya, Jr. C. E.
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W. Demers, Supervising Hydrographer.
Antonio Baldonado, District Hydrographer.
Manuel Trani, Asst. Hydrographer.
Francisco Aquino, Asst. Hydrographer.
P. del Castillo, Jr. Hydrographer.
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Alberto A. Centeno, Asst. Chief Water Rights Inspector.
Mariano N. Leones, Supervising Surveyor.
John P. Utinsky, Overseer.

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[illegible]milio Buenaventura, Asst. C. E., Mindoro.
[illegible]fredo V. Martinez, Acting D. E., Camarines Norte.
Silvestre Tan Chauco, Acting D. E., Camarines Sur.
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Julio A. Reyes, Asst. C. E., Bohol.
H. R. Meehleib, Acting D. E., Leyte.
Liborio Urtizberea, Asst. C. E., Leyte.
Leandro Espejo, Asst. C. E., Leyte.
Eladio M. Santos, Asst. C. E., Leyte.
Pastor Avisado, Acting D. E., Samar.
Alberto C. Centeno, Asst. C. E., Samar.
Jose Ignacio, Asst. C. E., Samar.
Ciriaco P. Rama, Surveyor, Samar.
Ambrosio Osmeña, Acting D. E., Or. Negros.
Carlos Rodriguez, Jr. C. E., Or. Negros.
Pedro M. Lladoc, Acting D. E., Masbate.
Juan Macaraeg, Div. E., Manila.
Jose Lozada, Acting D. E., Zamboanga.
Manuel T. Tubungbanua, Asst. C. E., Zamboanga.
Sergio Palencia, Jr. C. E., Zamboanga.
B. T. Saldaña, Acting D. E., Cotabato.
Gregorio Alcantara, Acting D. E., Davao.
Jose Viacrucis, Asst. C. E., Davao.
W. J. Hollis, Acting D. E., Sulu.
Jose F. Rocha, Asst. C. E., Sulu.
Cirilo Cabilete, Acting D. E., Lanao.
Roy N. Allen, Acting D. E., Misamis.
Luis Novenario, Asst. C. E., Misamis.
Roy N. Allen, Acting D. E., Bukidnon.
Mariano F. Chiyuto, Acting D. E., Agusan-Surigao.
Marcelo Operario, Jr. C. E., Agusan-Surigao.

LEGEND

Div. E. = Division Engineer.
C. E. = Civil Engineer.
D. E. = District Engineer.
Asst. C. E. = Assistant Civil Engineer.
Jr. C. E. = Junior Civil Engineer.
E. & M. E. = Electrical and Mechanical Engineer.

P552

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DOCUMENTS

THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS • PHILIPPINE ISLANDS

BULLETIN

Vol. 14 JANUARY 1, 1926 No. 1

221495

BINMALEY BRIDGE, PAO-LINGAYEN ROAD, PANGASINAN PROVINCE

CONVERSION TABLE

One peso (₱) = 50 cents, U. S. currency.

One kilometer (Km.) = 0.62 mile.

One kilogram (Kg.) = 2.20 pounds (lbs.).

One centimeter (cm.) = 0.39 inch.

One meter (m.) = 3.28 feet.

One hectare = 2.47 acres.

One cubic meter (cu. m.) = 1.31 cubic yards.

One hectare meter per day = 8.107 acre feet per day.

One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) second feet.

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1925

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, P. I., April 9, 1926

SIR: I have the honor to submit herewith the Report of the Bureau of Public Works for the Fiscal Year ending December 31, 1925.

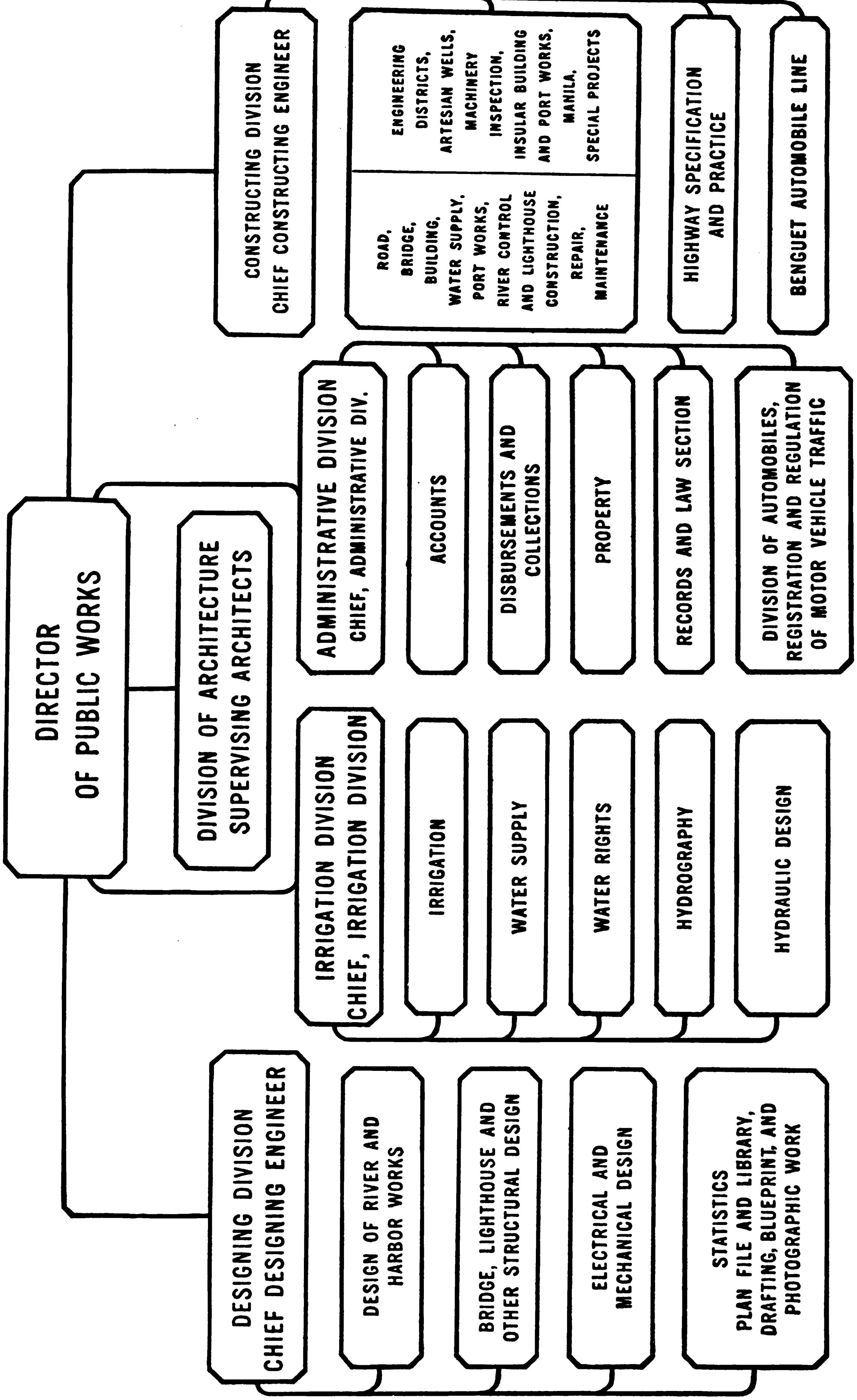
Very respectfully,

A. D. WILLIAMS
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1925


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS PLAN FILE AND LIBRARY, DRAFTING, BLUEPRINT, AND PHOTOGRAPHIC WORK
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
ADMINISTRATIVE DIVISION CHIEF, ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE

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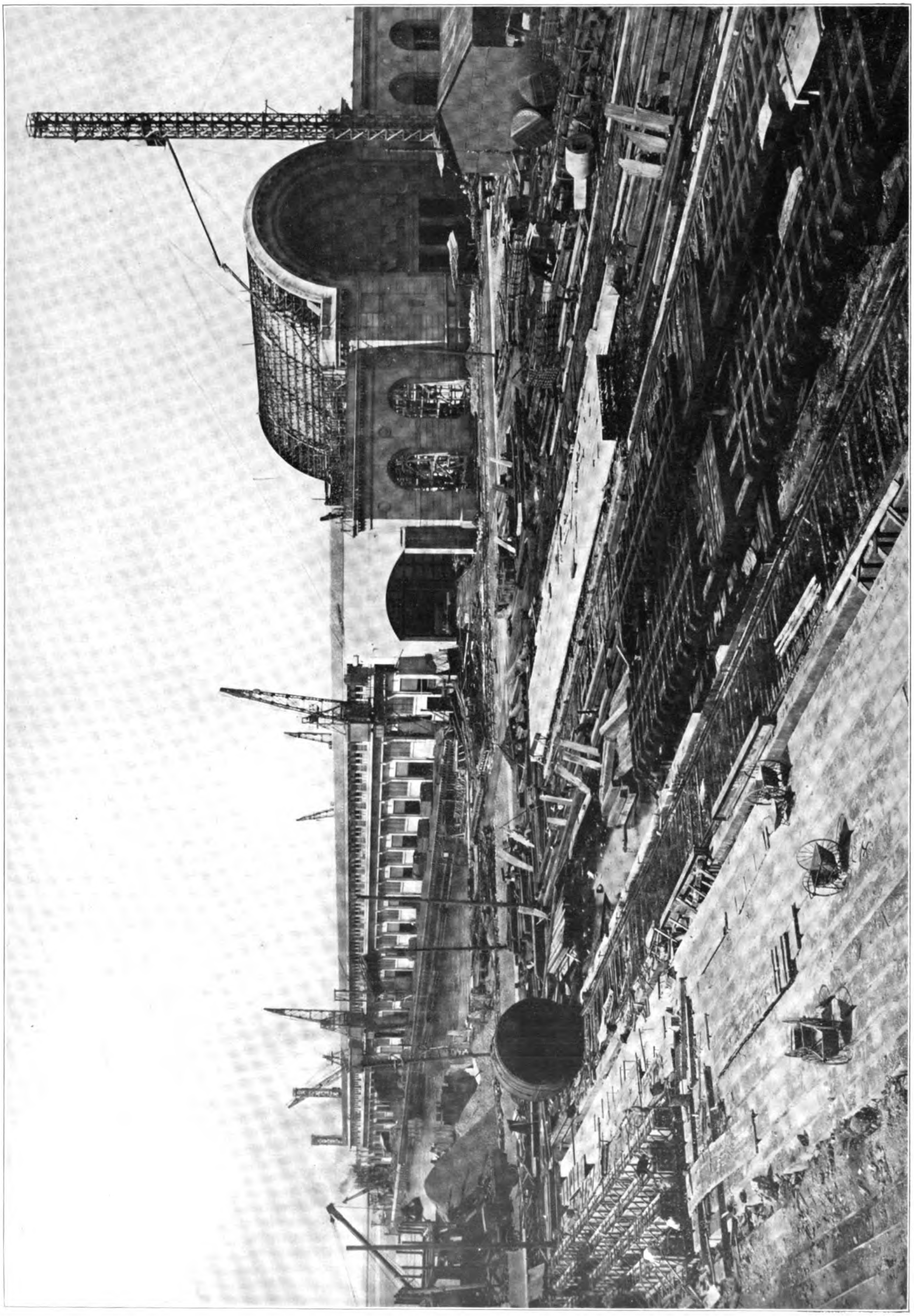


PIER NO. 7 UNDER CONSTRUCTION, MANILA

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and principal functions of the Bureau of Public Works are shown in the organization diagram on the preceding page. The Philippine Islands are now divided into forty-nine (49) engineering districts which, with the exception of a separate district for the City of Manila, are co-extensive with provincial limits. The district engineer is the local representative of the Bureau in each district and is responsible for all activities, excepting the larger irrigation projects which are constructed by project engineers under the direct supervision of the Manila Office. The Central Office in Manila prepares plans and specifications for construction projects and exercises general supervision over all activities of the Bureau.

PERSONNEL

Number of employees paid direct from Bureau and Project Funds as of December 31, 1925: Americans, 19; Filipinos, 357.

(NOTE.—The corresponding figures for December 31, 1924, are 19 and 357, respectively.)

Number of technical employees, December 31, 1925: Americans, 16; Filipinos, 174.

(NOTE.—The corresponding figures for December 31, 1924, are 17 and 141, respectively.)

American technical employees

Position	Permanent	Temporary	Total
Civil engineer	8	1	9
Assistant engineer	1	1	2
Electrical-mechanical engineer	2	1	3
Surveyor	1	0	1
Architect	1	0	1
Total	13	3	16

Filipino technical employees

Position	Permanent	Temporary	Total
Civil engineer	47	13	60
Assistant civil engineer	62	24	68
Junior civil engineer	4	5	9
Mechanical engineer	1	0	1
Assistant mechanical engineer	1	2	3
Assistant mechanical and electrical engineer	0	1	1
Assistant electrical engineer	1	0	1
Junior electrical engineer	1	0	1
Surveyor	5	0	5
Junior surveyor	2	0	2
Supervising architect	2	0	2
Architect	2	0	2
Agricultural inspector	1	0	1
Total	129	45	174

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau by whatever branch of the Government paid:

Changes	American	Filipino	Total 1925	Total 1924
Number of appointments	1	240	241	204
Number of transfer to Bureau	0	5	5	7
Number of separation for cause	0	14	14	12
Number of voluntary resignations	0	143	143	134
Number of transfers from Bureau	0	4	4	8
Number of retirements	2	1	3	3
Number of separations due to expiration of employment	1	5	6	2
Number of deaths	0	4	4	6

NOTE.—Item "Number of appointments" includes new and probational appointments.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1925

Items	Insular expenditures				Provincial and municipal expenditures		Funds from private sources		Total	
	Bureau of Public Works		Appropiation controlled by other Bureaus							
	1924	1925	1924	1925	1924	1925	1924	1925	1924	1925
Roads and bridges	₱151,580.33	₱204,558.90	₱60,983.06	₱32,866.86	₱7,918,504.75	₱8,730,473.43	....	....	₱8,131,068.14	₱8,967,899.19
Telegraph, telephone, and cable lines	364,521.40	358,773.62	....	....	59,553.98	80,049.63	....	....	424,075.38	438,828.25
Buildings	81,817.59	139,957.41	321,740.05	946,000.29	1,882,153.38	1,856,449.38	₱6,395.41	....	2,292,106.43	2,942,407.08
Wireless station buildings including towers, and masts	532.53	1,069.03	2,135.73	325.80	....	....	....	....	2,668.26	1,394.83
Maintenance, alteration, and repairs of public buildings	397,549.40	434,678.21	18,928.06	4,411.39	200,529.34	197,702.17	34.70	₱5,383.23	617,041.50	642,175.00
River and harbor works (including lighthouses, buoys and beacons)	1,580,353.40	1,683,919.51	1,588,625.80	1,385,152.75	28,037.24	38,405.57	....	3,137.33	3,197,016.44	3,110,615.16
Artesian wells and water supply	225,986.56	168,936.73	17,793.60	13,501.36	475,477.41	1,111,959.76	32,654.56	4,422.36	751,912.13	1,298,820.21
Irrigation projects	202,339.31	207,594.67	1,821,690.43	2,497,775.19	3,860.68	2,858.87	22,812.59	32,383.30	2,050,703.01	2,740,612.03
Benguet automobile line	80,000.00	90,000.00	....	....	....	....	....	....	80,000.00	90,000.00
Registration and regulation of motor vehicle traffic	50,000.00	50,000.00	....	....	....	....	....	....	50,000.00	50,000.00
Los Baños quarry	120,000.00	110,000.00	....	....	....	....	....	....	120,000.00	110,000.00
Operation and maintenance of central garage	36,000.00	19,030.59	....	....	....	....	....	....	36,000.00	19,030.59
Board of examiners for engineers and architects	2,000.00	2,000.00	....	....	....	....	....	....	2,000.00	2,000.00
Regulation, safeguarding of traffic and collection of tolls on Kennon and Naguilian Roads	9,000.00	9,000.00	....	....	....	....	....	....	9,000.00	9,000.00
Miscellaneous	....	....	173,489.09	172,480.44	231,640.83	242,161.31	6,197.67	4,024.51	411,327.59	418,666.26
Total	3,301,680.52	3,479,518.67	4,005,385.82	5,052,514.08	10,799,757.61	12,260,060.12	68,094.93	49,350,73	18,174,918.88	20,841,443.60

BALANCE SHEET, BUREAU OF PUBLIC WORKS

Assets	1924	1925
CURRENT:		
Cash, collecting and disbursing officer	₱1,649,469.37	₱1,605,498.15
Cash (deposit), Insular Treasury	(1,193,679.45)	(2,998,560.00)
Accounts receivable	2,311,365.46	4,331,808.90
Supplies and materials	701,696.20	714,219.80
Prepayments	747.13	623.71
INVESTMENT:		
Loan to municipality of Antipolo	12,000.00	8,000.00
Total current assets	3,481,598.71	3,661,590.56
FIXED PROPERTY:		
Real property and improvements	42,587,036.97	43,693,073.93
Equipment	3,502,223.98	3,545,182.57
(Less depreciation)	(837,031.99)	(763,448.85)
Total assets	48,733,827.67	50,136,398.21

Liabilities	1924	1925
CURRENT:		
Accounts payable	₱1,237,086.21	₱1,916,837.40
Accrued leave payable	210,548.60	198,927.50
Undistributed collections	1,646.47	19,900.67
Deferred credits to income	9,267.32	5,532.78
Fiduciary fund	18,524.30	6,157.97
Insurance reserve	29,869.16	29,699.76
CURRENT SURPLUS:		
Motor vehicle special fund, Act 3045	49,296.97	112,735.59
Wireless station buildings and towers	1,069.03	....
Construction of buildings, etc	135,354.76	101,799.35
Maintenance, alteration, and repair of public buildings	177,003.34	142,325.13
Irrigation systems	59,161.58	41,566.91
Artesian wells and waterworks	197,384.76	57,694.33
Harbor and river improvement	956,429.98	596,032.60
Roads and bridges	36,584.36	28,284.45
Telegraph, telephone, cable, etc	357,085.97	391,832.35
Lighthouse, buoys, and beacons	5,285.90	12,263.77
Total current liabilities	3,481,598.71	3,661,590.56
PRINCIPAL ACCOUNT SURPLUS:		
Invested in fixed property	45,252,228.96	46,474,807.65
Total liabilities	48,733,827.67	50,136,398.21

STATEMENT OF APPROPRIATION, INCOME, AND EXPENSES

Debit	1924	1925
Reversion of unexpended balances of administrative appropriation	₱30,007.83	₱44,571.14
Reversion of receipts	1,016,159.45	910,891.00
Operating expenditures offset by receipts	6,675,516.56	8,917,881.67
Expenditures, administrative appropriation	915,638.17	898,904.86
Outlays, purchase of equipment	3,617.26	5,029.27
Total debit	8,640,939.27	10,777,277.94

Credit	1924	1925
Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱945,646.00	₱948,505.27
Receipts—prime cost	6,675,516.56	8,917,881.67
Receipts—surcharges	807,692.23	806,580.60
Receipts—miscellaneous	121,447.51	56,622.08
Gain on supplies sold	1,659.82	1,663.49
Inventory adjustments	13,495.31	11,093.22
Income from rentals	13,257.58	21,029.59
Sales of fixed assets	1,607.98	1,543.98
Prior year's credit	60,416.28	12,458.04
Total credit	8,640,939.27	10,777,277.94

OPERATION STATEMENT, BUREAU OF PUBLIC WORKS

Operating revenue	1924	1925
Rental	₱13,257.58	₱21,029.59
Surcharges	807,692.23	806,580.60
Gain on goods sold	1,659.82	1,563.49
Inventory adjustments	13,495.31	11,093.22
Sales of fixed assets	1,807.98	1,543.98
Other service income	117,830.25	56,622.08
Prior year's credit	60,416.28	12,458.04
Total	1,016,159.45	910,891.00

Operating expenses	1924	1925
Supervising, technical, and clerical services—(salaries)	₱737,026.30	₱726,342.91
Labor	49,391.87	46,321.95
Consumption of supplies and materials	42,024.27	41,755.91
Rental of buildings	24,034.31	24,000.00
Illumination and power service	7,011.52	7,918.43
Traveling expenses of personnel	22,838.13	26,405.92
Repair service	5,742.38	7,596.18
Postal, telegraph, telephone and cable service	12,290.32	11,335.46
Other expenses	18,896.33	7,228.10
Total operating expenses	919,255.43	898,904.86
Operating profit	96,904.02	11,986.14
Total	1,016,159.45	910,891.00

SPECIAL APPROPRIATIONS

Name of activity	Appropriation		Reversion of appropriation		Expenditures		Income	
	Act 3123	Act 3217						
	1924	1925	1924	1925	1924	1925	1924	1925
1. Registration and regulation of motor vehicles	₱50,000.00	....	....	....	₱50,000.00	....	₱633,214.36	₱798,438.62
2. Regulation and safeguarding of traffic and collection of tolls	9,000.00	₱9,000.00	....	....	9,000.00	₱9,000.00	35,895.13	29,297.15
3. Benguet auto line	80,000.00	90,000.00	....	....	80,000.00	90,000.00	110,670.67	151,424.21
4. Los Baños quarry	120,000.00	110,000.00	....	....	120,000.00	110,000.00	75,339.85	67,447.46
5. Board of Examiners for Engineers and Architects	2,000.00	2,000.00	....	....	2,000.00	2,000.00	1,990.00	2,860.00
6. Central garage	36,000.00	36,000.00	....	₱16,969.41	36,000.00	19,030.59	19,459.19	10,922.82
Totals	297,000.00	247,000.00	....	16,969.41	297,000.00	230,030.59	876,568.25	1,060,390.26

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) TO DECEMBER, 1925

	1924	1925
1. Principal account surplus from previous year	₱44,590,358.35	₱45,252,225.26
2. Purchase of equipment	21,568.82	52,776.22
3. Fixed property brought into account	1,061,281.85	1,198,711.98
4. Equipment acquired by transfer	397.82	4,875.30
5. Equipment found at station including worn out tires taken into account	1,668.36	840.20
6. Equipment acquired by construction	....	543.77
Total debit	45,675,275.20	46,509,972.73

	1924	1925
1. Equipment sold	₱1,809.37	₱1,535.10
2. Equipment condemned on Insular inventory report, dropped on affidavits, undersold, etc	88,930.27	73,583.14
3. Equipment dropped by transfer to provinces and municipalities	53,231.93	27,450.05
4. Equipment and fixed assets dropped by transfer to other Bureaus	368,008.64	6,179.93
5. Depreciation written off	(88,930.27)	(73,583.14)
6. Principal account surplus, December 31	45,252,225.26	46,474,807.65
Total credit	45,675,275.20	46,509,972.73

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first class	Kilometers	245.3
Reinforced concrete bridges and culverts completed (in this figure, concrete pipe culverts are not included)	Number	63
Successful deep wells completed	do	104
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	do	109
Insular irrigation systems completed	do	3
Waterworks projects completed (total population served 36,290)	do	10

Expenditures supervised during the year 1925 as compared with the year 1924

	1924	1925
Total expenditures	₱18,174,918.88	₱20,841,443.60
Total expended upon road and bridge work	8,131,068.14	8,967,899.19
Total expended upon building work	2,911,816.19	3,585,976.91
Total expended upon port works	3,197,016.44	3,110,615.16
Total expended upon water supply	751,912.13	1,298,820.21
Total expended upon irrigation projects	2,050,703.01	2,740,612.03
Operation of auto line, quarries and the supervision of motor vehicle traffic	286,000.00	271,030.59
Expenditures on miscellaneous items account for the balance	846,402.97	866,489.51

ROAD WORK

Roads in existence in the various provinces of the Philippines as of December 31, 1925

Province	First-class road	Second-class road	Third-class road	Total road	Trails
	Kms.	*Kms.*	*Kms.*	*Kms.*	*Kms.*
Abra	58.2	19.9	14.6	92.7	112.5
Agusan	17.3	7.7	23.2	48.2	45.7
Albay	198.8	35.9	57.2	291.9	98.1
Antique	108.8	116.0	3.5	224.3	13.7
Baguio	46.9	15.8	.2	62.9	....
Bataan	38.3	19.5	2.6	60.4	75.0
Batangas	199.8	23.9	149.2	372.9	47.6
Benguet	72.4	59.9	8.1	140.4	8.4
Bohol	238.5	93.7	30.6	362.8	8.0
Bukidnon	....	102.6	16.6	119.2	93.8
Bulacan	116.3	138.6	63.9	318.8	....
Cagayan	72.8	85.1	52.3	210.2	119.9
Camarines Norte	32.3	8.1	5.6	46.0	8.7
Camarines Sur	155.0	24.2	57.4	236.6	30.1
Capiz	193.6	102.3	12.5	308.4	117.8
Cavite	82.4	32.3	9.7	124.4	107.8
Cebu	334.7	272.1	103.7	710.5	30.5
Cotabato	22.1	1.9	46.0	70.0	336.8
Davao	27.0	7.7	52.4	87.1	577.1
Ilocos Norte	79.8	117.6	1.5	198.9	48.1
Ilocos Sur	180.3	18.8	.8	199.9	....
Iloilo	287.1	48.6	140.5	476.2	8.9
Isabela	82.1	43.1	99.2	224.4	....
Laguna	159.8	19.6	51.9	231.3	28.9
Lanao	44.3	19.7	36.2	100.2	281.7
La Union	117.2	36.1	21.0	174.3	9.5
Leyte	140.0	75.2	79.9	295.1	56.3
Marinduque	51.5	25.0	.5	77.0	58.6
Masbate	34.6	9.9	11.2	55.7	....
Mindoro	24.4	47.8	22.3	94.5	273.5
Misamis	113.7	110.7	71.2	295.6	131.3
Mountain Province	....	13.0	306.5	319.3	1,068.3
Nueva Ecija	189.5	43.1	228.8	461.4	....
Nueva Vizcaya	42.7	26.5	61.7	130.9	146.7
Occidental Negros	348.9	56.6	63.1	468.6	68.8
Oriental Negros	161.1	18.0	72.2	251.3	173.5
Palawan	....	8.8	45.3	54.1	72.5
Pampanga	201.1	60.0	96.8	357.9	....
Pangasinan	472.9	39.4	165.5	677.8	....
Rizal	184.1	22.6	21.3	228.0	15.0
Romblon	....	44.7	3.0	47.7	256.6
Samar	107.5	67.8	139.6	314.9	34.1
Sorsogon	105.3	69.4	14.3	189.0	....
Sulu	18.3	23.8	15.2	57.3	94.2
Surigao	54.3	2.0	5.4	61.7	15.0
Tarlac	145.5	7.9	29.4	182.8	26.8
Tayabas	181.6	33.5	53.3	268.4	....
Zambales	59.6	34.2	40.0	133.8	....
Zamboanga	61.9	49.3	32.6	143.8	115.5
Total	5,664.3	2,359.9	2,639.3	10,663.5	4,815.3

DEFINITIONS FOR ROAD CLASSIFICATION

First-class roads.—Well-graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. Those roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first- and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing

	December 31, 1924	December 31, 1925
	Kilometers	*Kilometers*
Stone	1,535.1	1,642.0
Gravel	3,536.3	3,762.5
Coral	1,760.8	1,741.3
Unsurfaced	3,483.7	3,517.7
Total	10,315.9	10,663.5

Concrete Overflow Section, Zamboanga-East Coast Road, Zamboanga Province, Mindanao

BRIDGE WORK

Durable bridges and culverts in existence

Fiscal year ending	All durable structures	
	Total number	Increase during year
June—		
1910	4,372	507
1911	4,842	470
1912	5,177	358
1913	5,654	508
December—		
1913 (6 months)	5,901	190
1914	6,206	305
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	56
1919	7,491	65
1920	7,521	30
1921	7,481	[a] 40
1922	7,562	81
1923	7,586	24
1924	7,613	27
1925	7,779	166

[a] Decrease.

NOTE.—The term "Durable bridges and culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The increase of 166 structures includes those actually completed during the year as well as those which should have been previously reported minus structures reported missing for the first time. The above figures are obtained from semi-annual reports of districts engineers.

Reinforced concrete structures in existence

Fiscal year ending	Total number	Total meters
June—		
1910	No data.	No data.
1911	2,004	7,709
1912	2,350	9,216
1913	2,854	11,224
December—		
1913 (6 months)	3,046	11,984
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280
1922	4,366	17,684
1923	4,400	18,045
1924	4,428	18,413
1925	4,575	18,894

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other classes of construction.

ARTESIAN WELLS

During the year 1925, there were, on the average, twenty-one (21) deep well rigs in the field, all of which were in active operation throughout the year. The average number of machines in operation for the year, not including those engaged in drilling private wells and those that were cleaning or repairing old wells, was 19⅝ per month against 17½ for 1924. The increase in the number of drilling machines operated during 1925 was made possible chiefly by the existence of a credit balance of approximately ₱135,000 from the 1924 Insular appropriations and the early release of the 1925 appropriations.

The total number of successful artesian wells drilled by the Bureau of Public Works from 1904 to 1925 is 1,751. This number includes private wells drilled from 1904 to 1923. These wells are capable of supplying a total of about 40,000,000 gallons of potable water per 12-hour day which at the rate of 20 gallons per person per day of 12 hours, would supply no less than 2,000,000 people.

Funds expended

	1925		1924	
	Pesos	Per cent	Pesos	Per cent
Successful wells	245,336.22	84	224,320.69	86
Unsuccessful wells	67,124.24	16	37,659.07	14
Total	312,460.46	100	261,979.76	100

Comparative cost of drilling

(a) UNSUCCESSFUL WELLS INCLUDED

	1925	1924	+ Increase — Decrease
Per meter	₱28.10	₱26.65	+ ₱1.45
Per foot	8.57	8.25	+ .32

(b) NOT INCLUDING UNSUCCESSFUL WELLS

Per meter	₱29.12	₱25.60	+ ₱3.52
Per foot	8.88	8.16	+ .72

Summary of deep well drilling, 1925

[Not including private wells]

	Number of wells drilled	Total depth in meters	Total flow in liters per minute
Successful:			
Flowing	40	4,134	7,524
Pumping	64	4,291	5,816
Total successful	104	8,425	13,340
Unsuccessful	20	2,693	....
Grand total	124	11,118	13,340

The aggregate depth of wells drilled in 1925 exceeded the depth of those drilled in 1924 by 1,437 meters.

Percentage of unsuccessful wells drilled (not including private wells)—1925, 16; 1924, 14.

Out of the total twenty unsuccessful wells drilled during 1925, only one was abandoned due to breaking of drive pipe at a considerable depth inside the hole. The rest were successfully completed, but the water obtainable was either salty or not suitable for drinking and domestic purposes.

Drilling machines operated by the Bureau of Public Works

Type of machine	In field	Stored at pipe bodega and property division	Total
Cyclone (belongs to the Province of Bulacan)	1	....	1
Keystone (operated by Los Baños Quarry)	1	....	1
Star	2	2	4
Columbia No. 3	13	1	14
Columbia No. 5	5	1	6
Columbia No. 10	....	4	4
Standard	....	1	1
Total	22	9	31

BUREAU OF PUBLIC WORKS MACHINE SHOP

The Bureau of Public Works shop completed 1,036 work orders from which an income of ₱102,179.07 was derived, as compared with 894 work orders completed during 1924, valued at ₱88,790.18. These figures show an increase of 142 work orders accomplished in 1925, and a corresponding increase in income of ₱13,380.29.

The Machine Shop personnel performed overtime work equivalent to 65 working days as against 135 working days in 1924.

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year ending December 31, 1925, there were 4,379 motor vehicles newly registered and 15,210 reregistered for operation, or a total of 19,589 motor vehicles, as compared with 15,676 registered during 1924. There were also 1,233 motor vehicles registered for storage. During this same period about 8,000 applicants for drivers' licenses were examined and 2,490 new licenses issued. Including renewals, 25,127 operators of motor vehicles were licensed during 1925.

The following is a comparative tabulation of motor vehicles registered during the years 1924 and 1925:

	1924	1925
Automobiles	10,973	13,549
Motor trucks	3,870	5,225
Motorcycles	833	815
Total	15,676	19,589

The campaign for the apprehension of violators of the Motor Vehicle Law was carried out more vigorously with the result that there were 1,243 licenses suspended and 20 licenses revoked as compared with 303 licenses suspended and 6 licenses revoked during 1924. The results of the campaign are as follows:

	Total number of cases reported		Cases for reckless driving		Cases for speeding	
	1924	1925	*Number*	*Per cent*	*Number*	*Per cent*
First quarter	105	545	90	17	33	6
Second quarter	253	664	101	15	59	9
Third quarter	273	776	204	26	9	1
Fourth quarter	210	718	178	25	62	9
Total	841	2,703	573	....	163	....

Provisions of the Automobile Law (Act 3045) commonly violated

	1924	1925
Section 20, overloading	294	662
Section 26-(*b*), reckless driving	189	573
Section 34, lights	139	180
Section 14 (*h*), driving without license	137	256
Section 26-(*a*), speeding	87	163
Number of deaths reported during the year	30	37
Number of licenses suspended during the year	303	1,243
Number of licenses revoked during the year	6	20
Amount of fines reported imposed during the year	₱22,613	₱25,801

COLLECTIONS AND EXPENDITURES

The following tabulation shows the yearly amount of funds collected and expended for the registration and regulation of motor vehicles from 1912 to 1925:

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,392.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	628,918.54	60,000.00
1924	633,214.36	50,000.00
1925	798,438.62	50,000.00

THE BENGUET AUTOMOBILE LINE

The Benguet Auto Line operated during the year, 5 first-class busses, 1 third-class bus, 1 combined passenger and express truck, 1 fire truck, 4 express and freight trucks, 12 special touring cars, 1 baggage delivery jitney, and 1 service car for mechanics, and handled 6,098 and 321 half rate first-class passengers, 13,556 and 1,446 half rate third-class passengers, 27,720 kilos of hand baggage, 1,832,814 kilos of express and freight, and 60,034.5 kilos of dead head express and freight. No serious accidents occurred in the operation of the line.

The appropriation authorized for the Benguet Auto Line for the year 1925 was ₱90,000, while the total receipts during the year, including collections made by the Manila Railroad Company for the months of November and December, 1924, but not including collections for the months of September, October, November, and December, amounted to ₱151,424.21. The estimated net earning therefore amounts to over ₱50,000.

THE KENNON AND NAGUILIAN ROADS

These two roads to Baguio were maintained in good condition at a very reasonable cost. Interruptions to traffic were of short duration during two typhoons and did not seriously inconvenience the public.

A comparative statement of traffic over these roads for the years 1923, 1924, and 1925 is given hereunder:

Summary of traffic over the Kennon and Naguilian roads

KENNON ROAD

Year	Pedestrains	Bullcarts	Animals led or ridden	Calesas	Motorcycles	Autos passenger	Autos Trucks	Wagons
1923	14,767	2,077	300	....	351	4,796	3,170	100
1924	12,173	2,924	198	....	1,150	6,137	4,398	48
1925	10,743	1,176	159	1	543	7,080	4,439	58

NAGUILIAN ROAD

1923	22,090	11,318	1,332	16	193	4,552	7,358	754
1924	23,136	8,538	676	13	112	4,455	8,436	315
1925	19,893	2,173	516	....	190	9,032	4,164	2,084

GOVERNMENT CENTRAL GARAGE

The Central Garage which was established in March, 1923, was closed on August 31, 1925 and the furnishing of transportation to Insular bureaus and offices in the City of Manila contracted for with the National Garage.

During the period from January 1st to August 31, 1925, the Central Garage operated the following cars: Ford, 4; Dodge, 3; Chandler, 1; and Renault, 1; and 35 different bureaus and offices of the Insular Government, the Province of Cavite and the City of Baguio, made calls for transportation as follows:

	Trips
Transportation within the city	1,517
Provincial	42

During the eight months period mentioned, the income of the garage was ₱10,761, and the operating expense ₱17,940.59. The cars were all old and dilapidated, resulting in high repair bills, and unsatisfactory service. The rates charged by the National Garage are from 10 to 30 per cent below the former Central Garage rates, and the service rendered by the contractor thus far has been very satisfactory. The contractor reports a total of 420 calls for transportation from September 1st to December 31, 1925.

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Chief Constructing Engineer*

ROADS

The maintenance of existing roads with the limited amount of funds available in most of the engineering districts received preferential attention and continued to be the most important activity of the division. It is expected, however, that the operation of Act No. 3248, enacted by the last Legislature, will greatly improve present conditions. This law increased the tax on gasoline to four centavos (₱0.04) per liter and sets aside the revenue from this tax and the tax of three centavos (₱0.03) per liter on lubricating oils for the maintenance and improvement of highways and where practicable for new construction. It is estimated that approximately ₱2,500,000 will accrue to this fund during 1926, which will be available for expenditure in 1927, and that this amount should increase at the rate of from 20 to 30 per cent per annum. The law provides that three-fourths of the fund must be distributed to all provinces on the same basis; i. e. one-third equally, one-third in proportion to cedulas sold and one-third in proportion to the length of improved roads; and that one-fourth of the fund shall be allotted in the discretion of the Secretary of Commerce and Communications for important interprovincial roads or roads subjected to unusually heavy traffic.

Hereunder are tables Nos. 1–A, 1–B, and 1–C showing the cost of road maintenance since 1911:

TABLE NO. 1–A.—*Costs of road maintenance first-class roads*

Year	Average cost per kilometer maintained	Average length in kilometers maintained throughout the year	Total cost of maintenance
June 30—			
1911	₱492.02	1,441.7	₱709,369.72
1912	463.20	1,785.3	826,972.11
1913	555.00	1,976.3	1,096,854.29
December 31—			
1913 (6 months only)	251.39	2,146.3	539,560.88
1914	479.91	2,288.1	1,098,082.54
1915	475.91	2,643.6	1,258,114.15
1916	516.89	3,177.5	1,642,404.93
1917	607.42	3,529.5	2,143,887.68
1918	717.79	3,840.7	2,756,810.70
1919	765.71	4,209.3	3,223,119.18
1920	700.96	4,561.2	3,197,202.28
1921	793.82	4,739.4	3,762,218.99
1922	866.27	4,854.5	4,205,289.25
1923	871.06	5,014.3	4,367,742.20
1924	855.75	5,213.0	4,461,035.06
1925	870.23	5,517.6	4,801,567.32

Calaban Zigzag—Kms. 438–439, Bontoc-Cervantes Road, Mountain Province

Table No. 1–B.—*Second-class and third-class roads*

Year	Average cost per kilometer maintained	Average length in kilometers maintained throughout the year	Total cost of maintenance
June 30—			
1911	₱112.87	2,160.0	₱243,805.39
1912	143.10	2,339.0	334,706.84
1913	127.53	2,376.0	302,974.25
December 31—			
1913 (6 months only)	100.45	1,721.7	172,953.50
1914	164.82	2,418.8	398,655.30
1915	147.44	2,692.2	396,930.57
1916	168.51	2,800.4	472,129.17
1917	183.27	3,057.0	560,258.92
1918	212.53	2,773.5	589,450.32
1919	220.92	3,152.5	696,440.38
1920	245.98	3,030.1	745,351.19
1921	233.14	3,200.3	746,102.24
1922	239.74	3,389.4	812,581.92
1923	270.23	3,535.6	955,440.81
1924	267.83	3,840.3	1,028,547.73
1925	250.25	4,281.8	1,071,511.31

Table No. 1–C.—*Total cost of road maintenance*

Year	First-class roads	Second-class roads	Total
1915	₱1,258,114.00	₱396,931.00	₱1,655,045.00
1916	1,642,404.00	472,129.00	2,114,533.00
1917	2,143,888.00	560,259.00	2,704,147.00
1918	2,756,811.00	589,450.00	3,346,261.00
1919	3,223,119.00	696,440.00	3,919,559.00
1920	3,197,202.00	745,351.00	3,942,553.00
1921	3,762,219.00	746,102.00	4,508,321.00
1922	4,205,289.00	812,582.00	5,017,871 00
1923	4,387,742.00	955,441.00	5,323,182.00
1924	4,461,035.00	1,028,548.00	5,489,583.00
1925	4,801,567.32	1,071,511.31	5,873,078.63

It will be noted from the above tabulations that the average cost of road maintenance has been steadily increasing since 1916. This fact is attributed to the increase in the number of motor vehicles and the consequent repair work necessary on old roads which were built as a rule for light traffic only. The increase in the number of motor vehicles is shown in the following table:

Table No. 2.—*Number of motor vehicles in operation in the Philippine Islands*

Year	Automobiles	Trucks	Total
1914	1,046	240	1,286
1915	1,727	303	2,030
1916	3,295	399	3,694
1917	9,524	559	5,083
1918	5,445	769	6,214
1919	6,892	1,310	8,202
1920	8,318	2,275	10,593
1921	9,481	2,747	12,228
1922	9,537	2,904	12,441
1923	9,662	3,118	12,770
1924	10,973	3,870	14,843
1925	13,549	5,225	18,774

Note.—Eight hundred fifteen (815) motorcycles registered in 1925 are not included in the above tabulation.

While the cost of maintaining provincial roads has been gradually increasing at the rate of about ₱600,000 per annum, the provincial road and bridge revenues have remained practically stationary as shown by the following Table No. 3:

Table No. 3.—*Provincial road and bridge funds*

Year	Cedula tax	Real property tax	Internal revenue allotment	Total
1916	₱2,090,808.00	₱637,831.00	₱739,354.00	₱3,467,993.00
1917	2,559,421.00	687,317.00	721,681.00	3,958,419.00
1918	2,381,084.00	724,493.00	718,500.00	3,824,077.00
1919	2,244,404.00	795,588.00	769,375.00	3,809,367.00
1920	2,395,749.00	934,586.00	769,375.00	4,099,710.00
1921	2,176,353.00	1,125,903.00	769,375.00	4,071,631.00
1922	2,299,018.00	1,401,162.00	769,375.00	4,469,555.00
1923 [a]	2,135,802.00	1,094,572.00	769,375.00	3,999,756.00
1924 [a]	2,249,309.00	1,208,194.00	769,375.00	4,326,878.00
1925 [a]	2,305,556.50	791,608.85	1,309,154.66	4,406,320.01

[a] The figures for 1923, 1924, 1925 were taken from Provincial Budgets and represent the estimated revenue and not the actual collection. The figures from 1916 to 1922 were taken from the Insular Auditor's annual reports and represent actual collection.

In order to make adequate provision for road maintenance in some of the provinces, it has been necessary to insist upon the policy of not allowing any provincial road and bridge funds to be expended for new construction, unless a sufficient amount is set aside for road maintenance. This policy has also been followed in allotting funds appropriated as Insular aid to provinces and in distributing the proceeds from the registration of motor vehicles.

Zigzag No. 2, Km. 414, Bontoc-Cervantes Road, Mountain Province

In allotting funds for construction projects preference has been given as a rule to the completion of the more important projects which have been under way for many years.

The total number of kilometers of first-class roads on December 31, 1925 was 5,664.3 as compared with 5,488.3 kilometers of first-class roads on December 31, 1924. This means an increase during 1925 of 176.0 kilometers as shown in detail hereunder:

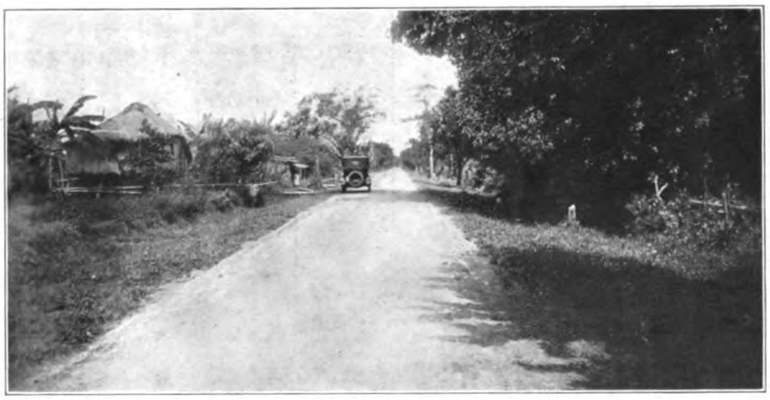
Increase in first-class road kilometerage during the year 1925

Provinces	Roads in existence December 31, 1924	Roads in existence December 31, 1925	Increase during the year 1925
	Kms.	*Kms.*	*Kms.*
Abra	58.2	58.2	
Agusan	17.3	17.3	
Albay	185.6	198.8	13.2
Antique	108.8	108.8	
Baguio	44.4	46.9	2.5
Bataan	37.0	38.3	1.3
Batangas	195.9	199.8	3.9
Benguet	78.6	72.4	[a] (6.2)
Bohol	230.7	238.5	7.8
Bukidnon			
Bulacan	116.3	116.3	
Cagayan	72.8	72.8	
Camarines Norte	25.3	32.3	7.0
Camarines Sur	148.9	155.0	6.1
Capiz	188.4	193.6	5.2
Cavite	82.4	82.4	
Cebu	325.1	334.7	9.6
Cotabato	19.8	22.1	2.3
Davao	21.3	27.0	5.7
Ilocos Norte	78.4	79.8	1.4
Ilocos Sur	179.6	180.3	.7
Iloilo	286.9	287.1	.2
Isabela	82.1	82.1	
Laguna	159.4	159.8	.4
Lanao	44.3	44.3	
La Union	98.6	117.2	18.6
Leyte	205.2	140.0	[b] (65.2)
Marinduque	42.5	51.5	9.0
Masbate	38.7	34.6	[c] (4.1)
Mindoro	21.4	24.4	3.0
Misamis	102.5	113.7	11.2
Mountain Province			
Nueva Ecija	181.9	189.5	7.6
Nueva Vizcaya	38.7	42.7	4.0
Occidental Negros	313.4	348.9	35.5
Oriental Negros	151.7	161.1	9.4
Palawan			
Pampanga	201.1	201.1	
Pangasinan	440.0	472.9	32.9
Rizal	180.9	184.1	3.2
Romblon			
Samar	107.5	107.5	
Sorsogon	93.0	105.3	12.3
Sulu	18.3	18.3	
Surigao	53.6	54.3	.7
Tarlac	134.8	145.5	10.7
Tayabas	165.8	181.6	15.8
Zambales	49.3	59.6	10.3
Zamboanga	61.9	61.9	
Total	5,488.3	5,664.3	176.0

[a] Transferred to La Union due to the relocation of boundary between these two provinces.

[b] Erroneously reported by the district engineer in his 1924 annual report.

[c] Reclassification of roads.



Rosario-Bolbok Road, Batangas Province

Layoc Bridge, Km. 106, Lubao-Hermosa Road, Bataan Province

The following are the more important road construction projects on which work was performed during the year:

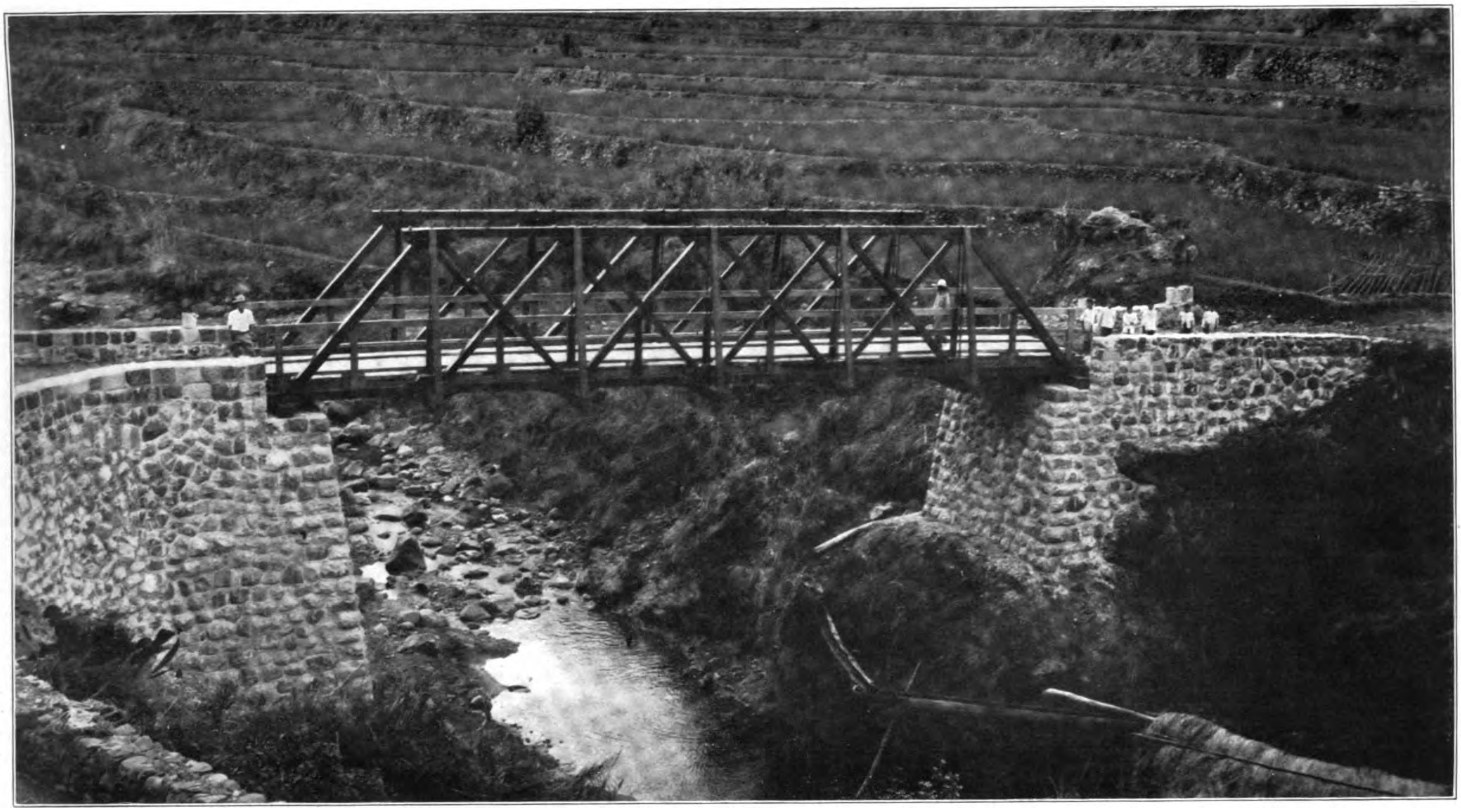
Rosario-Bolbok Road, Batangas Province.—This road is 22.1 kilometers long, 15.3 kilometers of which have been declared first-class. In order to open the entire road to traffic it was necessary to surface the uncompleted portion with first course metal only due to lack of funds. This road is an important connecting link in the road systems of Batangas and Tayabas Provinces through Candelaria.

Damortis–Agoo Road, La Union Province.—This project is 10.6 kilometers long and was completed as first class in August, 1925, at a cost of approximately ₱43,000. This road fills the gap in the Manila–North Road through La Union Province and has shortened land communication between Manila and Ilocos provinces by about forty (40) kilometers since it is no longer necessary to go via Baguio.

Cagayan Valley Road, Nueva Ecija Province.—The section of the Cagayan Valley Road within Nueva Ecija Province from kilometers 138.8 of the Manila–North Road, to Balete Pass is 72.2 kilometers long. This road is of great importance since it provides the only means of land communication with the provinces in the Cagayan Valley (Nueva Vizcaya, Isabela, and Cagayan). Forty-seven and two-tenths (47.2) kilometers are declared first-class road and the remaining sections, which are from 4 to 6 meters wide, are being constantly improved and will be completed as first class as rapidly as available funds permit.

Cagayan Valley Road, Nueva Vizcaya Province.—The section of the Cagayan Valley Road within Nueva Vizcaya Province extends from Balete Pass to San Luis, a distance of 102.3 kilometers. Forty and seven-tenths (40.7) kilometers are declared first class, 26 kilometers second class, and 35.6 kilometers third class. The actual expenditures during 1925 for construction purposes amounted to ₱56,000. The further improvement of this road is of urgent importance because it facilitates land transportation between Isabela and Nueva Vizcaya, especially for the exportation of rice from Nueva Vizcaya to Isabela.

Cagayan Valley Road, Isabela Province.—The section of the Cagayan Valley Road within Isabela Province extends from San Luis to Cagayan boundary, a distance of 141.2 kilometers, 74.3 kilometers of which are completed as first class and the remaining portion consists of second-class road and new subgrade. The entire subgrade from Cauayan to Ilagan, 34 kilometers, and from Ilagan to Cabagan, 40 kilometers, was completed during the year. The total expenditure for construction was ₱144,030.70.



Bauko Bridge, Bontoc-Cervantes Road, Mountain Province

Hereunder is a tabulation showing the status of all active road construction projects in the different provinces:

Road construction projects

Province	Project	Length of road	Estimated cost	Total appropriation to December 31, 1925	1925 appropriation		Total expenditure	Work accomplished
					Insular	Provincial		
		Kilometers						*Per cent*
Abra	Peñarubia-Villaviciosa	25	₱165,000	₱34,997	₱3,000	....	₱30,863	26
Do	Bangued-La Paz	12.5	110,000	28,539	8,000	₱24,128	11,718	14
Agusan	Butuan-Cabadbaran	16.6	325,000	254,396	15,000	....	243,196	15
Albay	Pandan-Caramoran	12.5	50,000	12,343	2,000	5,283	6,586	25
Do	Viga-Pañganiban	22.7	22,000	12,441	2,000	1,068	8,820	20
Do	Virac-Calolbon	22.3	206,000	112,153	10,000	5,151	109,920	77
Do	Albay-Sorsogon	15+100	234,520	148,204	....	....	147,709	90
Do	Tiwi-Naga-Joroan	4	70,000	23,350	....	12,537	22,721	20
Do	Polangui-Ponso-Ligao	13+400	52,000	14,285	7,000	....	14,297	50
Do	Guinobatan-Masarauag	4	35,000	11,502	....	8,050	10,436	30
Antique	Patñongon North Road	97	600,000	242,971	....	20,000	242,876	40
Do	Antique-Iloilo	11.09	238,350	233,017	20,000	....	231,978	96
Do	Bugason-Valderrama	11.44	146,000	8,978	....	....	8,978	6
Bataan	Bataan-Zambales	37.9	157,100	59,400	....	....	59,386	38
Batangas	Tanauan-Talisay	15.6	152,519	124,490	11,000	12,567	123,772	60
Do	Lipa-Balete	12	98,192	58,376	5,000	....	58,046	40
Do	Balayan-Calatagan	24	300,000	85,257	20,000	1,076	64,974	34
Do	Rosario-Bolbok	22.5	89,000	74,812	....	....	69,508	63
Do	Batangas-Taysan	12	120,000	18,795	8,000	8,679	14,685	8
Do	Bauan-Mabini	10	40,000	10,416	....	4,417	7,733	8
Bohol	Bacani-Carmen	28.1	249,990	170,894	....	36,519	163,510	80
Do	Carmen-Sierra Bullones	12.0	47,255	7,416	....	7,416	6,158	40
Do	Corella-Sikatuna	8.07	26,418	8,437	....	8,437	7,900	30
Bulacan	Sibul-Biaknabató	7	87,900	22,251	....	574	22,213	25
Cagayan	Cagayan Valley	64	800,000	410,599	30,000	75,932	426,049	60
Do	Aparri-Pamplona	72	....	20,000	20,000	1,154	20,986	5
Camarines Norte	Talisay-Labo-Paracale	34.4	136,833	104,580	17.500	....	102,789	83
Camarines Sur	Naga-Danao-Junction	17.39	392,692	243,073	....	10,568	242,852	91
Do	Pili-Bula	7.00	72,300	27,903	....	2,474	27,766	70
Do	Calabanga-Balongay	8.56	72,840	13,290	....	....	13,290	58
Capiz	Iwisan-Sapian-Balete-Banga	55	1,162,000	90,838	....	547	81,444	16
Do	Cabugcabug-Balasan	23.5	180,000	145,661	....	4,695	143,380	95
Cavite	Naic-Maragondon	8.15	40,000	14,733	4,000	....	13,631	20
Do	Pasongkawayan-Buenavista	3.3	50,000	24,181	....	....	24,180	91
Do	Tanza-Amaya	4.5	120,000	93,576	6,000	....	93,576	98
Cotabato	Lumupug-Bual	12.0	60,000	13,062	13,062	....	13,062	12
Davao	Coabo-Mati-Boston	219.0	2,000,000	141,135	....	18,751	141,134	37
Do	Davao North Road	124.2	350,000	58,693	....	4,882	58,693	14
Do	Davao South Road	161.5	400,000	175,411	15,000	25,134	175,411	44

Road construction projects—Continued

Province	Project	Length of road	Estimated cost	Total appropriation to December 31, 1925	1925 appropriation		Total expenditure	Work accomplished
					Insular	Provincial		
		Kilometers						*Per cent*
Ilocos Norte	Bangui-Claveria	53.0	₱2,500,000	₱326,884	₱15,000		₱320,065	30
Do	Piddig-Solsona	10.4	50,000	20,359	5,000		14,405	30
Do	Pinili-Banna-Nueva Era	14.2	210,000	10,089	10,000		4,335	2
Ilocos Sur	Candon-Bauguen-Galimuyod	12.4	98,000	31,337	20,000	₱10,408	8,200	2
Iloilo	Guimbal-Tubungan	12.54	75,000	14,813		4,507	14,789	15
Do	Guimbal-Igbaras	9.0	65,000	58,023		6,385	58,016	95
Do	Ilcilo-Antique	19.0	644,000	256,653	30,000	4,060	255,977	80
Do	Janiuay-Lambunao	16.0	170,000	96,267		16,222	93,814	72
Isabela	Cagayan Valley	74	800,000	235,596	25,000	68,413	235,491	40
Do	Angadanan Viejo-Angadanan Nuevo	6	47,800	31,205	10,000	13,904	29,838	70
Laguna	Pagsanjan-Luisiana	18.0	281,410	204,995	15,000		196,447	67
Do	Pila-Dayap	7.8	80,711	38,409		6,873	34,955	41
Lanao	Overton-Kolambugan	38.6	315,000	8,265		8,265	1,844	10
La Union	Balaoan-Santol	12.0	74,000	7,675		1,656	6,746	3
Leyte	Baybay-Abuyog	43.3	505,490	131,933			130,445	54
Do	Maasin-Matalom	27.0	240,500	144,523	8,000		142,870	83
Do	Dulag-Abuyog	34.7	271,500	43,059	10,000		38,317	27
Do	Ormoc-Capoocan	33.0	55,500	52,892		22,548	52,605	64
Marinduque	Mogpog-Balanacan	9.7	96,700	96,708		35	96,695	100
Do	Santa Cruz-Torrijos	28.0	291,903	85,319	16,000	4,300	85,203	29
Do	Malbog-Torrijos	20.0	500,000	16,000	6,000	10,000	11,237	2
Masbate	Masbate-Lumbang	7.0	190,561	52,228		30,575	44,170	40
Do	Masbate-Dimasalang	41.2	90,000	10,000		10,000	1,049	
Mindoro	Calapan-Pinamalayan	65.0	1,391,602	340,610	28,000	60,520	298,492	21
Mountain Province	Bontoc-Tagudin	125	454,000	30,000	30,000		30,000	30
Do	Bagabag-Kiangan	34	100,000	15,000	15,000		15,000	30
Nueva Ecija	Cagayan Valley	58	3,200,000	1,283,457	40,000		1,282,264	60
Do	Pantabangan-Baler	60.0	3,000,000	26,490		5,464	26,463	5
Do	Cabanatuan-Aliaga	11.2	60,000	49,686			49,679	90
Do	Talavera-Licab	20.7	135,000	115,641		10,012	115,630	75
Do	Cabanatuan-Bongabon	28.0	150,000	84,911	10,000	9,197	84,891	40
Do	Santa Rosa-Zaragosa	12.0	100,000	57,421		10,571	56,169	55
Do	San Jose-Lupao	14.59	80,000	18,471	15,000		18,357	20
Do	Cuyapo-Nampicuan	6.122	70,000	6,535		6,535	6,276	15
Do	Casili-Rizal	28.4	190,000	30,166		6,799	28,899	13
Nueva Vizcaya	Cagayan Valley	49	800,000	289,557	40,000		289,557	12
Occidental Negros	Fabrica-Escalante	25.7	283,000	22,225		16,249	219,701	98
Do	La Carlota-La Castellana	4.1	70,000	59,154		10,477	57,993	81
Do	Maao-La Carlota	5.28	42,365	23,667	13,000		14,213	33
Oriental Negros	Dumaguete North Road	117.0	547,576	398,557		20,634	398,585	66
Do	Dumaguete South Road	50.0	140,000	139,147		5,607	139,135	99
Do	Guihulgan-Vallehermoso	33.0	10,600	10,562	10,000	562	10,239	90
Pampanga	Porac-Santa Rita	12.1	150,000	6,192	6,000		2,697	23
Pangasinan	Binmaley-San Carlos	5.7	113,303	50,965	9,000	6,220	50,388	37
Do	Mangatarem-Tarlac Boundary	11.7	228,906	52,860	7,350		51,505	77
Do	Labrador-Bugalon	3.5	108,933	17,560		6,875	17,507	51
Do	Binalonan-Pozorrubio	9.871	57,243	28,204		22,050	27,546	86
Do	Agno-Bani	14.0	177,650	60,944		22,666	59,120	97
Do	Burgos-Dosol-Infanta	30.23	281,728	22,140	20,000	2,140	22,113	95
Do	Rosales-Santa Maria	14.46	256,366	25,601	15,000	10,601	7,134	
Rizal	Antipolo-Teresa	7.0	60,000	53,804		7,413	53,804	95
Romblon	Carmen-Alcantara	8.84	600,000	139,536	20,000	6,708	132,224	35
Samar	Catbalogan North Road	41.8	1,168,000	560,658		10,000	552,066	47
Do	Catbalogan-Wright-Taft	30.2	1,140,000	233,984			2,339,447	42
Do	Allen-Lavezares	9.0	95,000	63,116		31,442	63,116	66
Sorsogon	Sorsogon-Albay	41	425,000	406,361	50,000		388,595	98
Do	Bulusan-Irosin	16.0		101,015	7,000	32,110	98,284	90
Sulu	Jolo-Taglibi	12.5	194,757	10,724		7,866	10,169	24
Do	Indanan-Parang	17.5	203,568	10,217		7,767	9,310	26
Do	Tandu Batu-Karungdung	18.0	250,560	5,008		2,641	4,974	10
Do	Campagayo-Kulay Kulay	9.0	299,280	4,014		2,148	2,760	5
Surigao	Placer-Gigaquit	16.0	250,000	53,694	14,000	35,781	49,129	11
Do	Carrascal-Lanuza	25.0	400,000	26,611	10,000	15,000	26,288	8
Tarlac	Pura-Guimba	8.8	100,000	73,559	13,000		72,926	100
Do	Murcia-Mabalacat	8.758	115,983	80,876		3,238	80,869	96
Do	Paniqui-Moncada	6.98	141,218	47,930		47,400	46,424	94
Tayabas	Panaon-Unisan	5.5	127,686	119,628		5,000	118,760	56
Do	Lucban-Sampaloc-Mauban	33.4	567,290	344,454	37,000		344,364	77
Do	Gumaca-Pitogo	4.65	66,530	30,421		30,000	9,267	5
Zambales	Subic-Olongapo	12.00	144,000	55,147	8,000		54,875	14
Do	Iba South Road	12.38	60,000	51,327	20,300		49,361	92
Do	Iba North Road	58.0	200,000	36,741	10,300		28,047	15
Zamboanga	Dapitan-Dipolog	14.5	10,400	10,328	10,000		9,670	45

Cagayan Valley Road, Cagayan Province.—This road is 117.17 kilometers long, 59 kilometers of which are declared first class. The work accomplished during the year consisted in the construction of approximately 32 kilometers of subgrade between Alcala and Lal-lo, and the construction of wooden bridges between Alcala and Gattaran. The expenditures for this project were ₱131,382.81.

Fabrica-Sagay-Escalante Road, Occidental Negros Province.—This road is almost completed as second class and it is now open to light vehicles throughout the year. The opening of this road will stimulate the industrial and agricultural development of the formerly isolated town of Escalante.

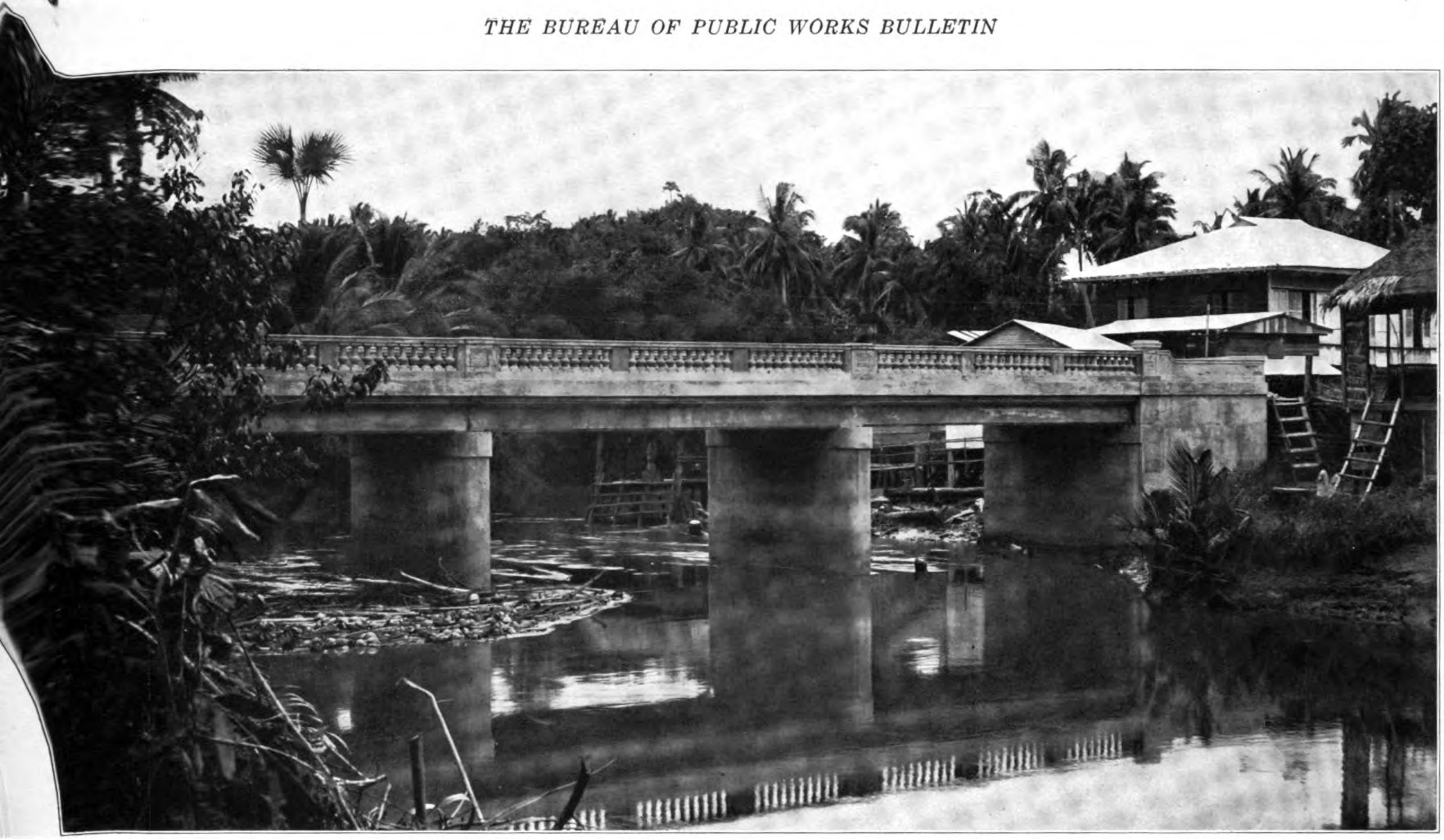
Sorsogon-Albay Road, Sorsogon Province.—The work accomplished during the year was the placing of second course metalling on 21.1 kilometers at a cost of ₱43,807, leaving an uncompleted section of 6.55 kilometers. This road is 62.33 kilometers long, 34.68 kilometers of which were completed in previous years. The opening of this road has greatly stimulated agricultural development in the district through which it passes.

Bontoc-Tagudin Road, Mountain Province.—During 1925 the section of the old trail between Butac and Bontoc (95 kilometers) was greatly improved, and at the end of the year it was possible to motor from Tagudin to Bontoc a distance of 125 kilometers. This road will be opened to light motor vehicles in March, 1926.

BRIDGES

The following are some of the more important bridges constructed or under construction during the year 1925:

Layac Bridge, Bataan Province.—The estimated cost of this bridge was ₱13,000, and the project was completed by contract for



Kalilayan River Bridge, Panaon–Unisan Road, Tayabas Province

₱12,607.82. It is a standard plan Howe Wooden Truss of 90-foot span. The bridge was opened to traffic on March 4, 1925.

Appagonan Bridge, Cagayan Province.—This bridge is on the Cagayan Valley Road near the town of Aparri. It is a standard reinforced concrete girder and slab type, consisting of four 9-meter spans with a clear roadway of 4.88 meters, and two 1.20-meter sidewalks. Construction work on this bridge was started in August and was 50 per cent completed at the end of the year. The work is being done by contract for ₱29,950, the estimated cost being ₱34,000.

Sevilla Bridge, Ilocos Sur Province.—This bridge is constructed over the Sevilla creek on the Manila–North Road within the limits of the municipality of Santa Cruz. It has three 9-meter spans of reinforced concrete slab and girder type, supported on concrete piles and "U" abutments. The estimated cost was ₱13,000. The bridge was advertised but, as no bids were received, it was built by administration at a total cost of ₱12,666.41.

Bago Bridge, Occidental Negros Province.—This is the largest and most important bridge project under construction during the year. It consists of five spans of 130′ steel through truss type. The contractor for the substructure made very slow progress due to some extent to unforseen difficulties encountered. However, it is expected that the work will now progress without any further trouble, and all the remaining work on the substructure will be completed by June, 1926. The contractor for the superstructure has delivered the structural steel at the bridge site, and, is ready to erect same. It is believed that the project will be completed and opened to the public by the end of 1926. The Mas Construction Co. are the contractors for the substructure and A. G. Yankey for the superstructure.

Binmaley Bridge, Pangasinan Province.—This bridge, located on the Pao–Lingayen Road, is a concrete girder pile bent type, and consists of five 9-meter spans. The estimated cost of this project is ₱30,000 and the total expenditure and liabilities to date amount to ₱26,360.52. The percentage of work completed to date is 30 per cent. The work is under contract with Mr. Juan Ferrer, a local contractor in Pangasinan Province. Work on the bridge was started in the latter part of the year 1925 and is to be completed on or about April 30, 1926.

Borongan Bridge, Samar Province.—This bridge was commenced the later part of 1924 and completed in the early part of 1925. This bridge is over the Borongan River and consists of seven 12-meter spans of the reinforced concrete slab and girder type. The cost of construction was ₱62,648.78.

Kalilayan Bridge, Tayabas Province.—This bridge, which was commenced in 1924 and completed in the early part of 1925, is over the Kalilayan River on the Panaon–Unisan Road. The bridge consists of three 9-meter standard reinforced concrete slab and girder spans, supported by two reinforced concrete pile bents and two "U" abutments. It was completed in March, 1925 at a total cost of ₱30,960.28.

BUILDINGS

MANILA

The Legislative (Insular) Building, as in the previous year, is the largest building project handled by this Bureau during the year 1925. It is a very large structure and the character of the work thereon requires supervision of a very high class, both by the contractor and the Government. Payments to the contractor, the Mas Construction Company, amounted to ₱1,067,222.40 during the year, and the project was approximately 75 per cent completed, as of December 31, 1925.

Work on the structure was continued steadily throughout the year and very good progress was made. All concrete for the main structure had been poured by the end of the year, and much of the interior finish was well under way. Numerous instances arose indicating the desirability of furnishing typical details for ornamental work, moulding, etc., with the proposal plans, to avoid the difficulty of fixing a price for extra work for items not clearly specified.

Important permanent bridges partially or completely constructed during the year 1925

Province	Name	Bridge and Km. No.—	Type	Span in meters or feet	Roadway in meter	Percentage of work completed	Cost of construction
						Per cent	
Bataan	Layac	106.74	Wooden Howe Truss Standard	90 ft.	4.88	100	₱12,607.82
Cagayan	Appagonan		Reinforced Concrete Deck Girder.	4-9.0 mt.	4.88	50	[a]34,000.00
Ilocos Sur	Sevilla	367.94	Reinforced Concrete Pile Bent Standard.	3-9.0 mt.	4.88	100	12,666.41
Occidental Negros	Bago	23.1	Five 130-foot Steel Truss	650′-0 ft.	4.88	20	[a]180,000.00
Pangasinan	Binmaley	251.74	Reinforced Concrete Pile Bent Standard.	5-9.0 mt.	4.88	30	[a]30,000.00
Samar	Borongan	23.0	Reinforced Concrete Deck Girder Standard.	7-12 mt.	4.88	100	61,545.91
Tayabas	Kalilayan	0.9	Reinforced Concrete Deck Girder Standard.	3-9.0 mt.	4.88	100	30,960.28

[a] Estimated.

PROVINCES

The following projects are the most important public buildings constructed during the fiscal year 1925.

Albay Provincial High School. (Province of Albay.) This high-school building, Pasig Type, consists of an Assembly Hall (with Portico and two side interior corridors, office, storeroom, and three classrooms); left and right wings with corridors having four adjoining classrooms to each; and a rear wing containing three rooms, one domestic science and two industrial rooms.

For lack of sufficient funds, the work to be done was let under three separate contracts, and the project was completed in December, 1925, at a total cost of ₱127,259.64.

Tarlac Municipal School Building. (Province of Tarlac.) This building is situated in the municipality of Tarlac, and is a Standard Plan No. 10, permanent structure, with two additional classroom. The contract for the complete construction of this building was awarded to Mr. Feliciano Nable, of Dagupan, Pangasinan, at the lump sum of ₱44,020, the building to be completed within 125 working days. The project was completed on September 23, 1925, or nine working days after the expiration of the contract time, and was turned over to the representative of the Bureau of Education on the same date. Total cost of the structure, including Insular and provincial surcharges, is ₱46,094.84, which is ₱924.25 less than the estimated cost.

Paniqui Central School, Standard Plan No. 10-A, Tarlac Province

Aparri Market. (Province of Cagayan.) This structure is a Standard Plan of 30 by 48 meters with a slaughter house of 8.9 by 12.2 meters. The two buildings were under contract with Mr. Fortunato Concepcion in the amount of ₱35,500. The work was started on April 14, 1925, and completed on October 7, 1925. Total cost of building, including the grading and Insular and provincial surcharges, is ₱48,504.91.

Umingan Market. (Province of Pangasinan.) This building is Type "B" Standard Plan. The construction work was commenced in February, 1925, and completed in September, 1925. The project was let under contract for the sum of ₱16,800. The outside dimensions are 21 by 39.80 by 8.22 meters. The structure of this building consists of reinforced concrete columns, floors and entablature made of Chinese tiles, wooden roof framing with a galvanized roof. The total cost of the structure, including tables and Insular and provincial surcharges, is ₱20,436.31.

Standard Temporary Central School Building, Batangas, Batangas Province

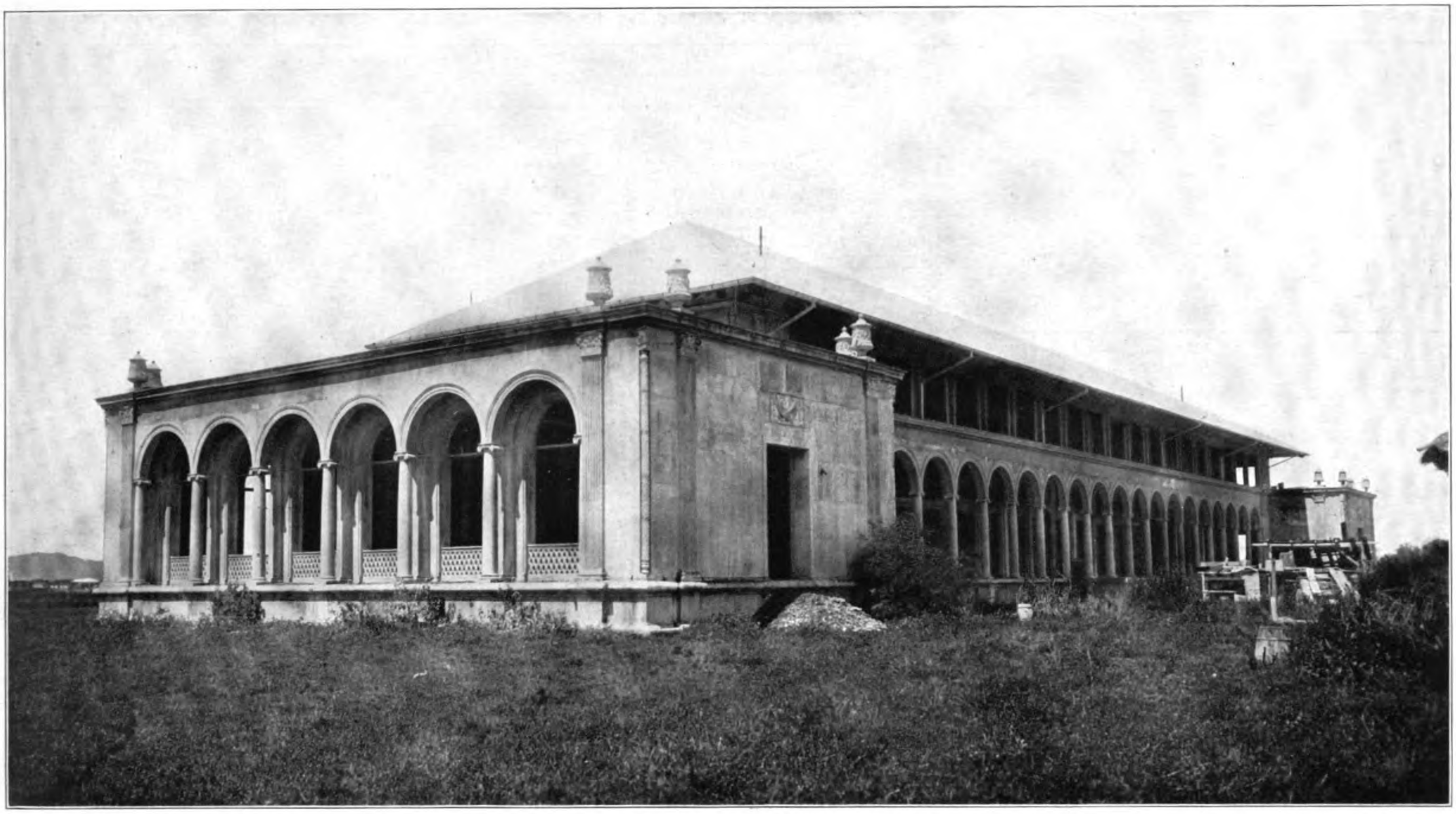
Tagbilaran Hospital. (Province of Bohol.) This is a Standard Hospital Building and its construction including plumbing and septic tank was awarded by contract to the Jereza Construction Co., contractor, of Cebu, who completed the structure in September. The contract price was ₱21,000, excluding interior wiring and light fixtures for electric lighting which cost ₱1,325. Total cost of the building, including Insular and provincial surcharges, is ₱26,663.64.

Dagupan Hospital. (Province of Pangasinan.) This project consists of stages Nos. 1 and 2, the Dispensary Pavillion, and the Administration Building, and kitchen, respectively.

The dispensary Pavillion is a one-story reinforced concrete building with galvanized iron roofing. Its principal dimensions are 7.40 by 14.70 by 7.40 meters, and 7.40 by 9.40 by 7.40 meters. Four rooms are provided.

The Administrative Building is of two stories and of reinforced concrete with galvanized iron roofing. The first and second stories provide seven rooms each not including the kitchen. The dimensions of the Administrative Building are 15.20 by 15.20 by 5.70 meters

Standard Municipal Building, Pozorrubio, Pangasinan Province



Central Unit of Standard Normal School Building, Iloilo, Iloilo Province
(Under construction)

for the first floor, and 15.18 by 15.18 by 8.15 meters for the second floor, and that of the kitchen, 9.60 by 9.60 by 7.92 meters. The construction of the first stage was started in January, 1924, by contractor Feliciano Nable and was completed in August, 1924. The contract price was ₱16,660. The Administrative Building, and kitchen were built under contract by Celasco and Company. The work on these buildings was started in July, 1924, and completed in April, 1925. The electrical installations for both buildings were done by Mora Electric Co. for ₱1,275 and ₱8,850, respectively. The Hospital has been officially opened to the public and has been in operation since August 8, 1925. Total cost is ₱65,227.09.

Pozorrubio Presidencia. (Province of Pangasinan.) This structure is of Gumaca type. It is a two-story building, and has four rooms on the second floor. The principal outside dimensions of the building are: first floor, 8.60 by 18.30 by 5.25 meters; and the second floor, 10.30 by 20 by 6.30 meters. The structure of the first floor consists of reinforced concrete walls and floor, shell windows, wood and iron doors and reinforced concrete steps; and that of the second floor, wooden framing and sidings, wooden floor and galvanized roof. The estimated cost of the structure was ₱21,569. Total cost of the building is ₱20,110.56. It has been completed and is being occupied by the municipal authorities.

Calbayog Presidencia. (Province of Samar.) This building is of an old Spanish type, and has two stories, the lower story being of concrete, and the second story, entirely of wood. Special plans were prepared for the reconstruction of this building. Its outside dimensions are 24.20 by 12.80 meters.

The reconstruction work was done by contract with Jereza Construction Co. of Cebu at a cost of ₱38,700. The work was completed in June, 1925, and was immediately inaugurated and occupied. Total cost is ₱49,597.14.

The following tabulations show hospitals, school buildings, presidencia buildings, market buildings and tiendas, and miscellaneous buildings that were completed in 1925:

HOSPITALS

Province	Municipality	Building	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Bohol	Tagbilaran	Dispensary pavillon	Concrete with G. I. roof	7.9 ×22.1	1,202	₱26,663.64
Cebu	Bantayan	Dispensary	Wood with G. I. roof	6.0 × 8.0	316	3,570.48
Occidenatal Negros	La Castellana	Emergency ward	do.	6.1 × 6.1	260	2,531.55
Do	Isabela	do.	do.	6.1 × 6.1	260	2,563.30
Do	Saravia	do.	do.	6.0 ×10.0	320	2,400.00
Do	Bacolod	Nurses' quarters	do.	8.0 ×16.0	605	5,678.15
Do	do.	Kitchen	Concrete with G. I. roof	9.6 × 9.6	644	10,051.19
Pangasinan	Dagupan	do.	do.	(a)	3,206	55,175.90
Tayabas	Lucena	do.	do.	9.6 × 9.6	517	10,350.77
Zamboanga	Zamboanga	Dispensary	Wood with G. I. roof	9.95×13.61	1,192	6,851.66

[a] Standard Stage No. 2 and kitchen.

SCHOOL BUILDINGS

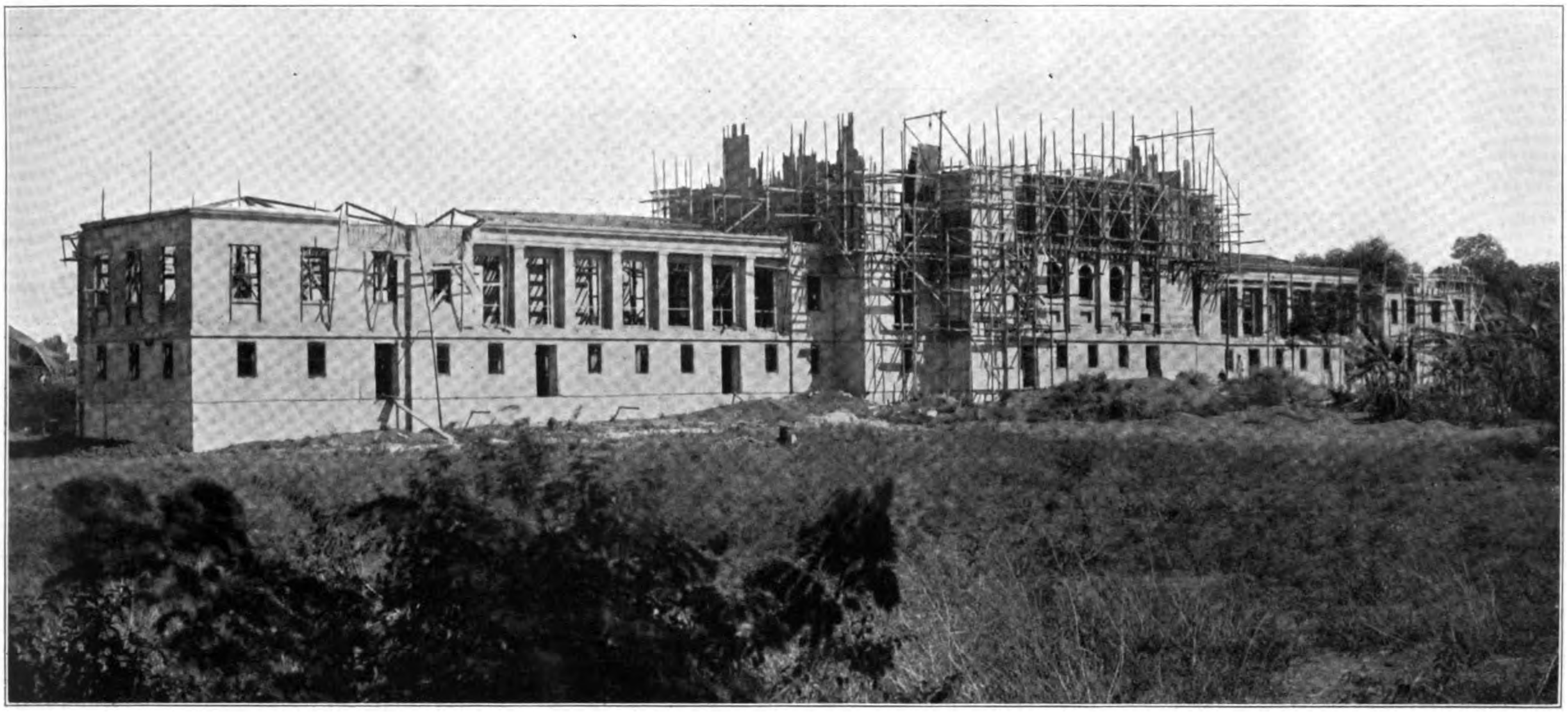
Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Albay	Albay	1	Concrete and wood with G. I. roof (Plan No. 20).	28.2 ×15.9 44.3 ×11.55	11,871	₱127,259.64
Do	Oas	1	Concrete with G. I. roof (Plan No. 7)	39.2 ×14.2	3,597	24,965.00
Antique	Patnongon	1	Concrete with G. I. roof	14.2 ×32.2	2,061	27,680.02
Batangas	Calatagan	1	Wood with G. I. roof (Plan No. 10)	12.2 ×15.2	1,192	6,619.87
Do	Calumpang	1	do.	12.2 ×21.2	1,770	10,222.43
Do	San Luis	1	do.	12.2 ×21.2	1,770	10,182.51
Bohol	Tagbilaran	1	Wood with G. I. roof (Plan No. 8)	10.4 ×41.1	3,101	26,572.68
Do	do.	1	Wood with G. I. roof (Domestic Science)	7.0 ×12.5	497	5,447.72
Camarines Sur	Naga	1	Wood with G. I. roof	12.0 ×28.0	3,409	21,599.22
Do	Baao	1	do.	12.0 ×21.0	1,585	9,980.86
Do	Nabua	1	do.	12.0 ×28.0	3,409	22,117.04
Capiz	Iuisan	1	Wood with G. I. roof (Plan No. 10)	12.2 ×28.2	2,753	9,419.16
Do	Panay	1	do.	12.2 ×28.2	2,753	8,758.19
Cavite	Noveleta	1	Concrete with G. I. roof	14.2 × 9.2	867	7,474.91
Cebu	Mactan	1	Concrete and wood with G. I. roof (Plan No. 2).	9.0 ×14.0	934	8,751.09
Do	Cebu	1	Wood with G. I. roof (special plan)	9.0 ×14.0	840	4,751.09
Cotabato	Bual	1	Wood with G. I. roof (Plan No. 10)	12.0 ×28.0	2,209	10,011.68
Ilocos Norte	Banna	1	do.	7.2 ×11.95	468	5,513.94
Do	Laoag	1 Normal	Concrete with Tile Roof and G. I.	70.4 ×13.75 23.8 ×12.7—2-story	17,362	442,434.22
Do	Sarrat	1	Brick and wood with G. I. roof	23.4 ×10.7 (Reconst.)	3,819	5,268.90
Ilocos Sur	Candon	1	Concrete with G. I. roof (Plan No. 10)	21.4 ×12.2	1,686	13,575.75
Iloilo	Leganes	1	Wood with G. I. roof	9.0 ×18.0	1,140	1,500.00
Do	San Joaquin	1	Masonry and wood with G. I. roof	12.8 ×45.75	2,789	2,000.00
Do	Tigbauan	Add. room	Concrete with G. I. roof (Plan No. 5)	9.1 × 9.2	593	4,048.20
Do	Maasin	1	Concrete and masonry with G. I. roof	10.1 ×51.0	3,101	7,848.89
Do	Santa Barbara	Add. rooms	Concrete with G. I. roof (Plan No. 5)	9.2 ×18.1	1,186	9,778.74
Do	Cabatuan	1	Concrete and masonry with G. I. roof	10.8 × 7.5 2-story	1,133	3,182.16
Isabela	Ilagan	1	Wood with G. I. roof	12.2 ×28.1 17.55×11.2	3,546	23,358.48
Laguna	Santa Cruz	Add. rooms	Concrete and wood with G. I. roof (Plan No. 20).	9.20×28.2	1,601	16,998.42
Leyte	Ormoc	1	Concrete and wood with G. I. roof	43.0 ×18.5—2-story	6,624	23,900.00
Manila	(San Felipe Neri) Government Orphanage School.	1	Concrete and wood	17.5 ×11.0 28.0 ×12.0 7.0 × 8.0	4,927	33,000.00
Mindoro	Lubang	1	Wood with G. I. roof	14.2 ×12.2	1,319	7,659.42
Misamis	Plaridel	1	Concrete and wood with G. I. roof (Plan No. 7).	39.2 ×14.2	3,619	31,565.00
Do	do.	1	do.	11.2 ×14.2	1,146	10,000.00
Do	Gingoog	1	Concrete with G. I. roof	39.2 ×14.2	3,619	25,630.00
Do	Cagayan	1	Wood with G. I. roof	50.0 ×24.5	3,938	16,500.00
Occidental Negros	Valladolid	1	Concrete and wood with G. I. roof (Plan No. 10-A)	12.2 ×28.4	1,672	17,093.04
Do	Isabela	1	do.	12.2 ×28.4	1,672	18,585.26
Do	La Castellana	Add. rooms	Wood with G. I. roof (Plan No. 20)	11.3 ×35.2	2,878	13,477.61
Oriental Negros	Zamboanguita	do.	Concrete and wood with G. I. roof (Plan No. 10).	28.0 ×12.0	2,376	11,999.58
Pampanga	Magalang	1	Wood with G. I. roof	9.2 ×32.2	2,150	9,204.01
Pangasinan	Agno	Add. rooms	Concrete with G. I. roof (Plan No. 7)	9.1 ×14.2	969	9,187.04
Do	Burgos	do.	Concrete and wood with G. I. roof	11.2 ×14.2	1,207	6,649.01
Do	Lingayen	do.	Concrete, wood, and sawale with G. I. roof.	11.2 ×42.1	3,538	16,392.67
Do	Umingan	do.	Concrete and wood with G. I. roof	11.6 ×28.1	2,361	14,704.32
Do	Pozorrubio	do.	do.	11.2 ×28.1	2,361	14,442.37
Do	Santa Barbara	do.	do.	11.6 ×14.1	1,228	8,588.72
Surigao	Surigao	1	Wood with G. I. roof (Plan No. 10)	50.3 ×24.8	7,152	31,400.00
Tarlac	Paniqui	1	Concrete with G. I. roof	24.9 ×51.4	6,781	39,903.93
Do	Tarlac	1	do.	31.9 ×51.4	7,633	46,019.14
Do	Bamban	1	Sawale and wood with G. I. roof	12.0 ×14.0	1,087	2,809.45
Tayabas	Mulanay	1	Wood with G. I. roof (Plan No. 7)	36.0 ×10.5	2,907	4,133.00
Do	Catanauan	1	do.	42.0 ×24.0	5,774	6,140.00
Zambales	San Narciso	Add. rooms	Wood with G. I. roof	9.0 × 8.5	593	2,243.17
Do	Santa Cruz	1	Concrete with G. I. roof	14.2 ×39.2	3,662	28,240.86

TEMPORARY SCHOOL BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Cebu	Santander	1	Wood with nipa roof	10.2 ×30.0	2,263	₱8,631.15
Iloilo	Calinog	1	Sawale and wood with nipa roof	9.0 ×41.0	2,417	3,562.80

PRESIDENCIA BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Bataan	Moron	1	Wood with G. I. roof	14.5 ×12.0—1-story	1,291	₱7,988.18
Davao	Lupon	1	Wood with G. I. roof (Plan No. 10)	13.5 × 9.0—1-story	748	8,896.84
Do	Sigaboy	1	Concrete and wood with G. I. roof	13.5 ×10.5	921.3	6,278.53
Iloilo	Dingle	1	Masonry, concrete, and wood with G. I. roof.	11.8 ×17.8—2-story (Reconst.)	1,831	14,406.31
Do	Banate	1	Wood with G. I. roof	9.0 ×18.0—2-story	1,495	6,000.00
Do	San Joaquin	Additional	Concrete with G. I. roof	6.2 × 6.9—2-story	522	7,000.00
La Union	Naguilian	1	Concrete and wood with G. I. roof	18.5 × 8.8—2-story	1,887	19,269.89
Leyte	Abuyog	1	Wood with G. I. roof	9.10×17.1—2-story	1,331	11,990.00
Mountain Province	Kabugao, Apayao	1	do.	16.3 × 6.6	737	7,383.29
Pangasinan	Pozorrubio	1	Concrete and wood with G. I. roof	8.6 ×18.3—2-story	1,910	20,110.56
Do	Balungao	1	do.	7.1 ×12.1—2-story	1,267	10,392.27
Do	Lingayen	1	Concrete and brick with G. I. roof	16.3 ×26.0—2-story	4,593	14,071.42
Rizal	Antipolo	1	Wood with G. I. roof	12.0 × 7.0—2-story	828	9,659.82
Samar	Calbayog	1	Concrete and wood with G. I. roof	12.8 ×24.0—2-story	3,132	49,597.14
Tarlac	San Manuel	1	Concrete and wood, sawale with G. I. roof	6.8 ×11.8—2-story	819	7,683.84
Do	Anao	1	Concrete, sawale, and wood with G. I. roof	6.8 ×11.8—2-story	819	7,914.26
Do	Bamban	1	do.	6.8 ×11.8—2-story	819	6,411.00



Capitol Building, Batangas Province
(Under construction)

MARKET BUILDINGS AND TIENDAS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Albay	Polangui	1	Concrete with G. I. roof	18.0×26.0	1,893	₱10,250.00
Cagayan	Aparri	1	do.	30.0×48.0	7,867	48,504.91
Do.	do.	Matadero	do.	8.9×12.2	510	
Camarines Sur	Iriga	1	do.	24.0×39.1	3,659	23,456.15
Do.	Naga	Tiendas	do.	10.2×40.7	1,806	21,549.89
Cebu	Mandawe	1	do.	18.0×38.0	5,854	12,068.46
Iloilo	Iloilo	1	do.	12.0×48.0	3,452	16,634.97
Isabela	Ilagan	1	do.	15.0×25.0	1,877	18,466.21
Laguna	Calamba	1	do.	74.0×35.4	3,381	17,900.00
Do.	Pagsanjan	1	do.	18.0×34.0	2,744	13,700.00
Occidental Negros	Hinigaran	Slaughter-house.	do.	7.6× 7.6	135	2,394.04
Pampanga	Florida Blanca	1	do.	12.0×25.5	1,691	6,955.23
Pangasinan	Umingan	1	do.	21.0×39.8	4,793	20,486.31
Tarlac	Tarlac	Slaughter house.	do.	8.9×12.2	469	4,886.28

MISCELLANEOUS BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions (in meters)	Contents (cu. m.)	Cost
Albay	Legaspi	Outhouse	Concrete and wood with G. I. roof	7.5 × 4.1	105	₱3,600.00
Bohol	Tagbilaran	Facade to Provincial Capitol.	Concrete	1.69 ×14.58—2-story	324	9,695.38
Do.	do.	Power House Radio Station.	Concrete with G. I. roof	13.0 × 9.0	470	3,581.00
Cebu	Mandawe	Employee's Quarters.	Wood with G. I. roof	18.0 × 8.2	844	13,144.12
Davao	Davao	Radio Operating Room.	Concrete and wood with G. I. roof	12.0 × 4.0	204	9,916.77
Do.	do.	Power House	do.	11.0 × 6.0	353	
Manila	Manila	P.G.H. Storehouse.	Concrete with con. roof	73.4 × 8.6	5,169	52,000.00
Misamis	Cagayan	Grandstand	Wood with G. I. roof	36.6 × 6.9	566	3,910.00
Occidental Negros	Bacolod	Bandstand	Concrete with G. I. roof	Radius 4.56	450	7,554.31
Oriental Negros	Dumaguete	Capitol	do	18.0 ×31.0—2-story	6,116	107,613.74
Rizal	Morong	Public Dispensary.	Wood with G. I. roof	11.6 × 9.5	631	4,601.50

DESIGNING DIVISION

WALTER J. GRODSKE, *Acting Chief Designing Engineer*

In continuation of the policy maintained during the past few years, special endeavors were taken to discourage the construction of temporary structures, and only in cases where insistence upon permanent construction would have made it impossible for a locality to finance necessary though minor improvements, were plans made contemplating the use of semipermanent materials. In general, however, for economical reasons it is believed the better policy to postpone construction until sufficient funds for permanent structures can be made available.

Standard Unit No. 2 Hospital Buildings, Dagupan, Pangasinan Province

The shortage of experienced and trained designing engineers has become more acute during the past year, and with the resignation of the supervising bridge engineer early in the year and the departure of the chief designing engineer for the States somewhat later, it has been absolutely impossible to cope with the large amount of new work in addition to the work which has been accumulating for some time past, for which funds are available and which should receive immediate attention.

As a result of the policy adopted by the Port Works Section in the matter of field investigation and study of the various ports, very gratifying results have been obtained through its field personnel which is especially fitted by training and long experience. The development of proper port facilities at the various provincial ports is of utmost importance to the commerce of the Philippines, and it is vitally essential that proper field investigation and study be given these projects to the end that the most economical and beneficial port development can be carried out.

The quality of concrete entering all structures built for the Government has been maintained at a very high average due to insistence upon strict compliance with the specifications in the matter of maintaining high compressive strength. The total number of tests on concrete materials has very greatly increased during the past year as will be noted from the following table:

	1924	1925	Increase
			Per cent
Total tests on cement (1/10 barrels tested)	3,678	5,359	46
Total tests on concrete	1,894	3,649	93
Total tests on sand	102	63	....
Total tests on gravel	70	48	....

Investigation of approximately 657 foreshore lease and land sales applications were made for the Bureau of Lands, an increase of 86 per cent over the number made during the year 1924.

Plans, specifications, and estimates for projects covering bridges, portworks, pumping and power plants, and other structures, as well as the activities of this division in the field, covering investigations, surveys, operation of cement gun, sand blast, and calyx core drill outfits, installations and construction are listed in Tables A, B, C, D, E, F, G, H, and I. Numerous and varied miscellaneous time consuming studies, technical consultations, investigations and reports, in addition to those listed in the tables, were made by the personnel of the various sections of this division throughout the year.

Due to the increase in the number of plant inspections and installations and bridge repair projects which, for economical considerations and in order to maintain efficiency, are activities properly assigned to this division, it has been found necessary to increase the number of the travelling temporary personnel during the past year.

The installation of a mercury vapor blue printing machine and electric drier has revolutionized the activities of that section of this division, and plans, which formerly required days for printing because of great accumulation of work which could not be undertaken by the former sun process, are now turned out in a few seconds.

A study was made and tentative plans prepared covering a signal system for the proposed joint use of the Aringay River Bridge of the Manila Railroad Company by highway traffic; but the project did not meet with favor when presented to the railway officials.

In connection with matters concerning contemplated improvements of port conditions and facilities at Manila, the chief designing was detailed to proceed to the United States with instructions to make a thorough investigation and study of the construction, operation, efficiency, cost of operation, cost of construction, etc. of the several types of modern dredges utilized in the larger American ports, giving special attention to the recently commissioned diesel-electric types, with a view to assembling plans and preparing specifications for that type of dredge best suited to operate most efficiently under local conditions at the Port of Manila and elsewhere in the Islands. Instructions were also given to obtain, with the assistance of the Purchasing Agent at New York, quotations from several plants building dredging equipment, after consulting with port authorities relative to the class of service and the efficiency obtained with such modern

Standard Public Market, Umingan, Pangasinan Province

port facilities and improvements as could be beneficially applied in Manila.

Further improvements have been made in the Insular Quarry at Los Baños thereby creating greater economies in the operation thereof. A new penstook for the hydroelectric plant has been installed together with an auxiliary water wheel of approximately 45-horse power which was constructed locally. Concrete towers for the new crusher location have been constructed, and plans and specifications for the new hydroelectric machinery and power house have been completed.

A new site for the Insular Powder Magazine, having many advantages over the old location which was blown up, has been obtained, and a study of the factors governing magazine design and construction has been made, the results of which will govern the execution of modern standard plans for powder magazines.

On the construction of Pier No. 7, the foundation difficulties, which necessitated the splicing of piles by as much as forty feet, were solved successfully by resorting to a type of construction never heretofore attempted. This consisted in driving the 110-foot concrete piles under water to the required bearing by means of a heavy cast steel follower, after which specially shaped reinforced concrete splices of sufficient length were set over the submerged pile heads and automatically made water tight by means of a double hemp and oakum gasket. The water was then pneumatically expelled from the space between the upper portion of the pile and the interior of the splice, and the pressure maintained until a cement mortar from a specially constructed grouting machine was forced into all the open spaces. A sample splice which had been grouted onto a pile showed, upon removal of the concrete shell, an absolutely perfect mortar filling of all spaces.

The close of the year showed the completion of the pier head of Pier No. 7, with the exception of a temporary passageway through which it will be necessary for the locomotive crane to make one future trip, as well as the construction and opening to traffic of 20th Street, Muelle de San Francisco, and 25th Street.

PORT WORKS AND MAINTENANCE

Owing to the limited appropriation, it was necessary to lay up some of the dredging equipment at Manila during the last quarter of the year. This procedure is especially detrimental to the upkeep of the harbor and Pasig River, Manila, because of the necessity of accomplishing the work as the monsoon permits.

As stated in the annual report for last year, it is necessary that at least one, and preferably two, more steel self-dumping scows be purchased for use with the two ladder dredges, if the lower Pasig is to be kept at the required depth. It is also urgently necessary that a new sea-going, hopper-type dredge, similar to the steamship *Dredger*, be acquired at once for the maintenance of the South Harbor. The steamship *Dredger* is so old that very extensive repairs to the hull will be required in the near future. It is also inefficient and has not sufficient capacity to cope with the amount of work required.

By contracting the disposal of the spoil, it was possible to accomplish considerable work on estero dredging at Manila, although lack of funds required discontinuance of the work after the middle of the year.

Dredge No. 4 was assigned to Iloilo on April 17, 1925, and continued at work there the remainder of the year. It is expected that the extension of the jetty at the mouth of the Iloilo River will obviate necessity of the large amount of dredging now required.

Itbayat Derrick.—Plans were prepared for a derrick at the Itbayat Landing, Batanes Province, and the derrick was constructed and assembled for trial at Manila. An attempt was made to ship the derrick to Itbayat in September on the steamship *Bustamante*, but rough weather prevented landing at Itbayat. Another attempt will be made early in the coming year.

Tagbilaran Channel.—Work of deepening the entrance channel of Tagbilaran Harbor, Bohol, was undertaken by administration in June and completed November first. The work comprised the dredging of a channel 50 meters in width and 60 meters in length across a coral reef and was accomplished by the use of explosives and the Cebu orange-peel dredge. The channel was deepened from a depth of 8 feet, to a depth of 16 feet below M.L.L.W. New Armco iron cylinder and cone markers were placed on the seven beacons marking the entrance channel to the harbor.

Aparri Seawall.—During the year, 200 linear meters of reinforced seawall with apron was constructed at Aparri. This work was done

The dredging work accomplished during the year is indicated in the following tabulation:

Dredging operations, 1925

Location	Total 1902 to 1924	Total for 1925	Steamship *Dredger*	Dredges							Total
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	
	Cu. m.	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*	*Cu. m.*
Lower Pasig River	7,536,690	224,340			224,340						7,761,030
Outer Harbor	3,986,819	296,949	296,500					449			4,283,768
Upper Pasig River	1,015,386	14,190				6,402		2,334		5,454	1,029,576
Inner Basin	530,179										530,179
Binondo Estero	78,831										78,831
Estero de la Reyna	252,320	23,208						3,017	20,191		275,528
Paco Estero	38,109										38,109
San Miguel Estero	59,285	1,557						1,557			60,842
Provisor Estero	31,681										31,681
Marine Railway, Engineer Island	44,767	640						640			45,407
Talim Island (city)	1,071										1,071
Outer Bar	1,330,134	76,380		34,080	42,300						1,406,514
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580										16,580
Engineer Island Canal	37,540										37,540
Vitas Estero	392,975	84,906					84,906				477,881
Quiapo Estero	12,507										12,507
Segado Estero	35,509										35,509
Pandacan Estero	172										172
San Lazaro Estero	22,975										22,975
Corregidor Harbor, Quartermaster	54,956										54,956
Iloilo River	2,420,020	343,806					343,806				2,763,826
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	28,920										28,920
District of Cavite	20,876										20,876
Tondo Beach	9,013	7,190				7,190					16,203
Santibañez Estero	24,216										24,216
Tanque Estero	28,057										28,057
Tacloban Wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato River	49,462										49,462
Earnshaw's Slipways	55,113										55,113
Los Baños Pier	11,160										11,160
United States Navy, Cavite	749,920	104,240	94,240		10,240						854,160
Concordia Estero	10,047										10,047
Malabon Canal	36,821										36,821
Port Libas, Capiz	31,413										31,413
Napindan Bar	81,431	19,425				19,425					100,856
Totals	19,671,086	1,196,831	390,500	34,080	276,880	33,017	428,712	7,997	20,191	5,454	20,867,917

under contract on a unit price basis which amounts to approximately ₱233 per linear meter of completed wall.

Dalahican Breakwater Protection.—Work on the construction of a riprap breakwater for the protection of the Dalahican section of the Manila–Cavite road was undertaken by the Atlantic Gulf & Pacific Company in January and continued until May when weather conditions prevented continuation of the work. Nine hundred linear meters of breakwater were constructed to a height of 0.8 meters above M.L.L.W. Work of extending and raising the breakwater to an elevation of 2.5 meters above M.L.L.W. was resumed in December. A total of 23,130 metric tons of rock was delivered during the year at a unit price of ₱3 per metric ton in place.

Cebu Jetty and Dredging.—The construction of a riprap jetty approximately 140 meters long in the harbor of Cebu was first advertised in November, 1924. The bids were considered excessive and were rejected and the project readvertised in January, 1925. Work on the project progressed very slowly and was practically abandoned by the contractor in September. Work was resumed however, by the contractor's bondsmen about December 1st and is now progressing at a fair rate of speed. A total of 1,709 metric tons of hearting rock and 849 metric tons of derrick rock were placed during the year.

Cebu Floating Derrick.—Plans were prepared and construction completed for a floating derrick dredge with a collapsible A-frame for the port of Cebu during the early part of the year and sent to Cebu in April. After being tried out in Cebu, the dredge was sent to Bohol for work on the Tagbilaran Channel and returned to Cebu early in November. This derrick dredge will remain continuously at Cebu to accomplish such dredging and derrick work as may be required. A total of 2,500 cubic meters of material was dredged at Cebu at a unit cost of ₱1.15 per cubic meter and deposited in the Cebu Reclamation Area.

Zamboanga Wharf Extension.—Bids received under the second advertisement for the Zamboanga wharf extension were opened in January, 1925 and a contract made for the construction of 75 linear meters of reinforced concrete wharf. Work on the project progressed so slowly that in August the contract was annulled and the work undertaken by administration. Since taking over the work from the contractor, most of the concrete piles have been cast and a pile driver constructed. The driving of the piles was started in December.

View of a Completed Section of Aparri Seawall, Cagayan Province

TABLE A.—*Bridges*

Province	River	Road	Type	Remarks
Albay	Putiao Creek	Albay-Sorsogon	Howe truss—24.4 m.	Specifications.
Do	Pili	do	do	Do.
Do	Kumadkad	do	do	Do.
Baguio	Teachers' Camp	Baguio-Antamok.	Steel balustrade.	Plans and specifications.
Do	do	Benguet	Steel tower, pipe suspension.	Plans.
Bataan	Limay	Limay-Orion	Timber trestle	Plans checked.
Batangas	Palico	Tuy-Nasugbu	Steel truss—48.8 m.	Plans and specifications.
Bukidnon	Manopale	Malaybalay-South.	Suspension—46.0 m.	Preliminary plan and estimate.
Bohol	Quinoguitan	Loay-Interior	Concrete arch—12.0 m.	Plans and specifications.
Do	Wahig	do	Suspension—46.0 m.	Preliminary plan and estimates.
Bulacan	Pinagcabalian	Malabon-Obando.	Timber trestle—57.0 m.	Do.
Do	Quingua	Manila-North	Additional steel truss—39.6 m.	Plans and specifications.
Do	San Miguel	San Miguel-San Juan.	Proposed wing walls.	Inspections and report.
Camarines Norte	Talisay	Talisay-Labo-Paracale.	Steel truss—24.4 m.	Plans and specifications.
Cavite	Silang	Dasmariñas-Paliparan.	Steel girder—14.3 m.	Do.
Cebu	Dayhagon	Cebu-North	Timber trestle—36.0 m.	Preliminary plan and estimates.
Ilocos Norte	Laoag	Manila-North	Proposed sidewalks.	Study.
Ilocos Sur	Abra	do	Suspension—330.0 m.	Preliminary plan and estimates.
Do	do	do	Cable ferry—330 0 m.	Plans and especifications.
Do	Butac	Tagudin-Cervantes.	Suspension—48.8 m.	Do.
Iloilo	Lamonan	Pasi-Calinog	Steel truss—30.0 m.	Preliminary plan and estimates.
Laguna	Lumbang	San Pablo-Sta. Maria.	Steel trusses—118.8 m.	Do.
Do	San Antonio	Biñan	Suspension—33.5 m.	Plans and specifications.
Manila	Pasig	Jones Bridge	North subway roadway.	Do.
Do	Luengo	Calle Zamora	Steel beams	Plans.
Nueva Ecija	Capintalan	San Jose-Sta. Fe.	Steel truss—27.4 m.	Plans and specifications.
Do	Pampanga	Manila-North	Steel trusses—586.0 m.	Preliminary plan and estimates.
Occidental Negros.	Bago	Bacolod-South	Pier and abutment.	Plan revised.
Do	Hinigaran	do	R. C. girders—162.0 m.	Preliminary plan and estimates.
Do	Ilog	do	R. C. girders—82.0 m.	Do.
Do	Malogo	do	R. C. girders—104.0 m.	Do.
Do	Maragandang	Bago-Maao	Steel truss—36.6 m.	Plans and specifications.
Do	Talaban-Dacu	Bacolod-South	R. C. girders—120.0 m.	Preliminary plan and estimates.
Pangasinan	Agno	Manila-North	Steel trusses—640.0 m.	Do.
Sorsogon	Putiao	Albay-Sorsogon.	Howe truss—30.5 m.	Plans and specifications.
Standard			Culverts lengthened.	Plans revised.
Do			Road signs	Plans and specifications.
Tayabas	Pagbilao	Manila-South	Protection work.	Do.

TABLE B.—*Port works*

Province	Port	Type of structure	Remarks
Batanes	Itbayat	Landing derrick	Plans and construction.
Bohol	Tagbilaran	Channel	Blasting and dredging.
Cagayan	Aparri	R. C. seawall	Contract executed.
Cavite	Manila-Cavite Road.	Breakwater protection.	Do.
Cebu	Cebu	Rock jetty	Do.
Do	do	Floating derrick	Plans and construction.
Davao	Santa Ana	R. C. wharf	Plans and specifications.
Iloilo	Iloilo River	Rock jetties	Do.
Manila	Manila, Pier No. 7	Pneumatic pile extension.	Plans and construction.
Do	do	Gang plank	Plans.
Do	do	End section	Plans and construction.
Do	do	Pier head	Construction.
Occidental Negros	Pulupandan	Port development and pier.	Plans and specifications.
Zamboanga	Zamboanga	Wharf extension	Contract executed.

TABLE C.—*Wiring of buildings*

Province	Location	Type	Remarks
Albay	Albay	High School	Inspection and supervision.
Batangas	Batangas	Capitol Building	Plans and contract.
Bohol	Tagbilaran	Dispensary Pavilion	Contract and inspection.
Do	Tagbilaran	Capitol Building	Installation by administration.
Davao	Davao	Presidencia	Contract executed.
Do	Santa Ana	Pier lighting	Plans.
Ilocos Norte	Laoag	Normal School	Completion by administration.
Do	do	Capitol Building	Resumed installation.
Ilocos Sur	Vigan	Dispensary Pavilion	Plans and contract.
Jolo	Jolo	Pierlighting	Plans.
Laguna	Santa Cruz	Ward Pavilion	Do.
Manila	Manila	Philippine General Hospital storehouse.	Inspection.
Do	do	Philippine General Hospital Guazon Memorial.	Plans and contract.
Occidental Negros	Bacolod	Hospital Building	Installation by administration.
Do	Pulupandan	Pier lighting	Plans.
Oriental Negros	Dumaguete	Capitol Building	Inspection and supervision.
Pangasinan	Dagupan	Hospital Building	Plans and contract.
Rizal	San Felipe Neri	Orphanage	Plans.
Samar	Calbayog	Presidencia	Inspection and supervision.
Tarlac	Tarlac	Hospital Building	Plans.
Tayabas	Lopez	Presidencia	Contract executed.

TABLE D.—*Oil engine driven electric systems*

Province	Location	Type	Remarks
Batangas	Batangas	Capitol and hospital lighting and power.	Plans.
Do	Bauan	Light and power	Preliminary study.
Bohol	Tagbilaran	do	Contract and inspection.
Camarines Norte	Daet	Street lighting plant.	Estimate.
Camarines Sur	Iriga	do	Installation by administration.
Ilocos Sur	Vigan	Hospital lighting	Contract executed.
Nueva Ecija	Muñoz School	Light and power	Plans and installation.
Pangasinan	Dagupan	Hospital light and power.	Installation by administration.
Do	Lingayen	Additions to system	Plans.

TABLE E.—*Hydroelectric plants*

Province	Location	Type	Remarks
Bataan	Orion	Power	Checked plans.
Ilocos Norte	Laoag-Vintar	Lighting system	Estimate.
Laguna	Los Baños	Quarry power	Plans and specification.
Do	San Juan	Power	Checked plans.
Mountain Province	Baguio	Second generating unit.	Purchase.
Nueva Ecija	Peñaranda	Power development	Preliminary plans.
Zamboanga	Zamboanga	Additions	Preliminary study.

TABLE F.—*Pumping plants*

Province	Location	Type	Remarks
Batangas	Batangas	Capitol and hospital hot water.	Plans.
Do	Bauan	Waterworks	Installation.
Do	Lipa	Pipe extension	Investigation.
Do	Rosario	Waterworks	Plans.
Bohol	Tagbilaran	Booster pump	Plans and contract.
Do	Tubigon	New pump	Installation.
Bulacan	Malolos	Waterworks	Inspection.
Cavite	Cavite	do	Installation.
Do	Indang	do	Do.
Laguna	Calamba	do	Plans.
Manila	Jones Bridge subway.	Sump pump	Plans and installation.
Mountain Province	Baguio	Lake fountain	Plans.
Nueva Ecija	Muñoz School	Pumping plant	Do.
Pangasinan	Dagupan	Hospital hot water	Installation.
Do	Lingayen	Waterworks	Plans and inspection.

TABLE G.—*Calyx core drilling*

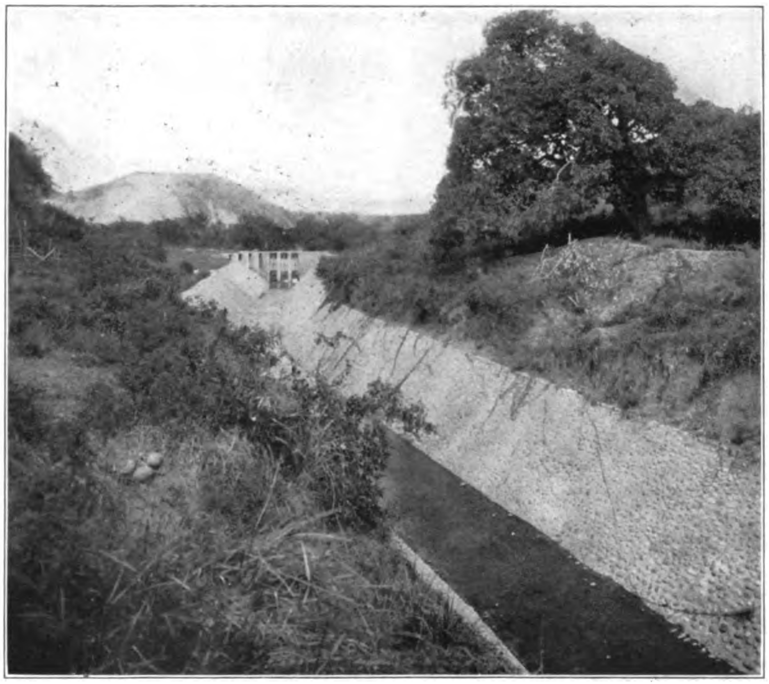
Province	Location	Type	Remarks
Antique	San Jose	Wharf	Borings completed.
Bohol	Lubac	Bridge	Do.
Do	Tagbilaran	Wharf	Do.
Bulacan	Pinagkabalian	Bridge	Do.
Capiz	Capiz	Wharf	Do.
Cavite	Cavite	Dry dock	Do.
Cebu	Cebu	Wharf	Borings commenced.
Davao	Santa Ana	do.	Borings completed.
Laguna	Pagsanjan	Bridge	Borings commenced.
Rizal	Parañaque	do.	Borings completed.
Sorsogon	Sorsogon	Wharf	Borings commenced.
Tarlac	Cutcut	Bridge	Borings completed.

TABLE H.—*Cement gun and sand blasting*

Province	Location	Type	Remarks
Cagayan	Misamis wharf	Repairs	Cement gun.
Cebu	Various jobs	do.	Do.
Leyte	Various bridges	Cleaning and painting	Sand blast.
Manila	Jones bridge	Waterproofing subway	Cement gun.
Do	Piers No. 3 and No. 5	Repairs	Do.
Do	Pier No. 7	Construction	Do.

TABLE I.—*Investigations and reports*

Province	Location	Type	Remarks
Antique	San Jose	Wharf	Investigation and survey.
Batangas	Manghinao	Adobe arch failure	Do.
Bohol	Loay	Jetty and channel	Do.
Do	Tagbilaran	Wharf	Do.
Davao	Santa Ana	do.	Do.
Ilocos Norte	Laoag-Vintar	Dam failure	Investigation and report.
Capiz	Capiz	Wharf and breakwater.	Investigation and survey.
Manila	Luengo	Old steel trusses	Investigation and report
Do	Manila Harbor	Dredges and Port equipment.	Investigation.
Do	do.	Dredging	Investigation and report.
Do	Dredge No. 1	Repairs	Do.
Do	Dredge No. 3	do.	Do.
Do	Dredge No. 5	do.	Do.
Do	Launches, etc.	Condition	Do.
Rizal	Tinajeros	Old adobe arch	Do.



Main Canal, Amburayan River Irrigation System, La Union Province

DIVISION OF ARCHITECTURE

C. M. MANDELBAUM, *Acting Chief of Division*

There was a considerable increase in the volume of work handled by this division due largely to increased building activities in the provinces. A number of requests were received from municipal authorities for plans of proposed additions or improvements to existing buildings. There was also a very noticeable increase in requests for the preparation of development plans for towns and plazas.

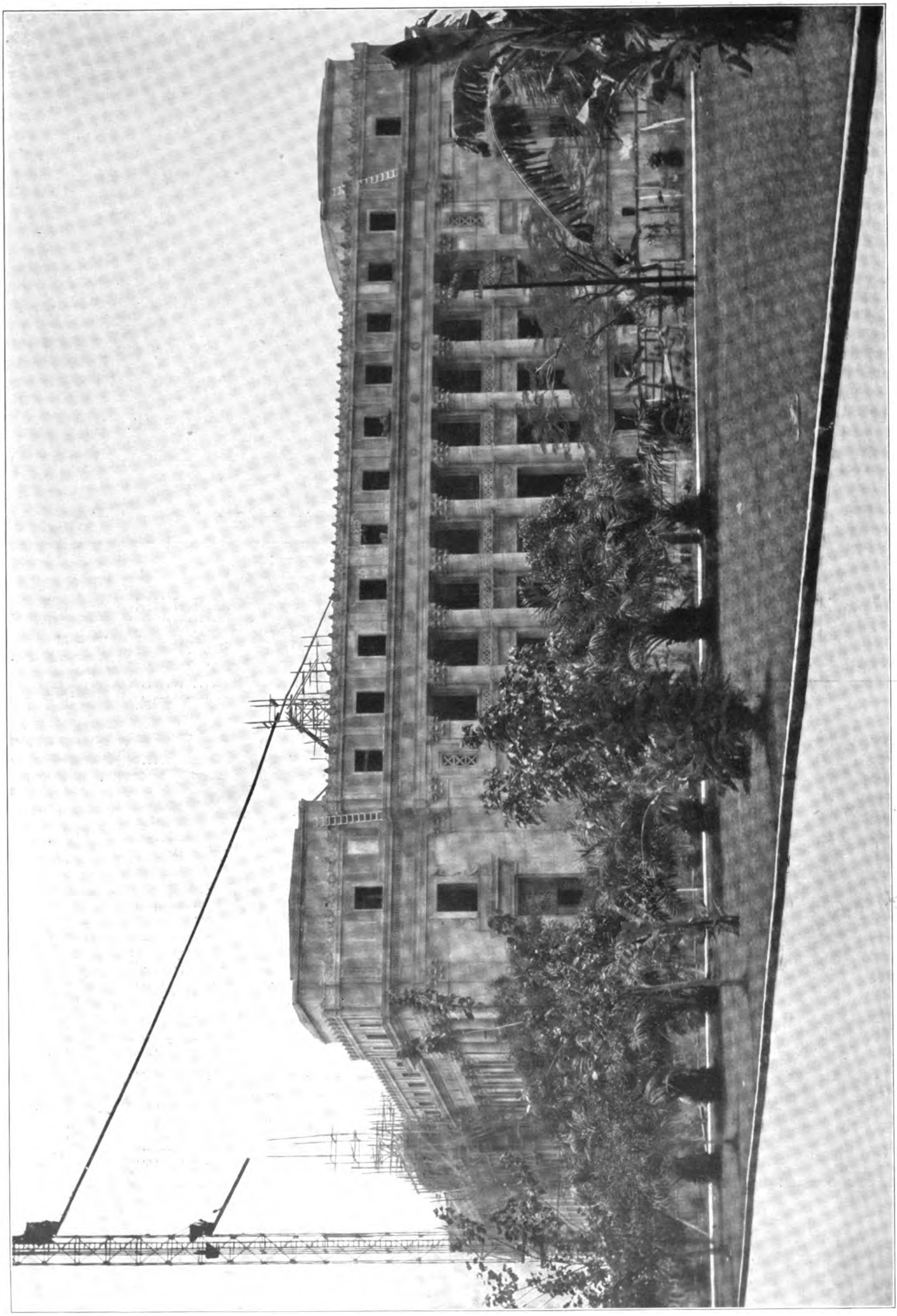
Standard plans for two new types of provincial hospitals were prepared with a view to having these buildings better suited to local conditions.

The necessary studies were made and plans prepared for a large number of projects contemplating street and park improvements in the cities of Manila and Baguio. New regulations adopted by the City of Manila during the year also require that this Bureau approve of plans as to architectural features, for private buildings to be constructed on the more important streets in Manila, such approval being required by law in the case of all private buildings constructed in Baguio.

The work accomplished by this division is shown in detail in the following tabulation of projects assigned to Messrs. Arellano and Mapua, supervising architects, as well as to Mr. Antonio Toledo, architect, during the time that Mr. Mapua was on leave:

Projects assigned to Mr. Arellano showing status of each

Manila projects	Status
1. Ayuntamiento Building Directory	Completed.
2. Proposed Bonifacio monument	Do.
3. Proposed Luneta bandstand	Preliminary drawings completed.
4. Proposed carnival city	Drawings completed.
5. Proposed alteration of facade properties of Jamias and Cabral.	Do.
6. Proposed addition to Paco market	Preliminary drawings completed.
7. Pergola for waiting station of Standard Oil Co.	Drawings completed.
8. Legaspi Landing	Preliminary drawings completed.
9. Luneta Park	Drawings completed.
10. Proposed garden for Intendencia Building	Completed.
11. Proposed improvement of streets layout, Plazas Goiti and Santa Cruz.	Plan submitted to the city authorities.
12. Proposed Standard Oil Co., Port Area, 25th Street to Boston Street.	Drawings completed.
13. Proposed waiting Station at Plaza Lawton	Preliminary drawings completed.
14. Proposed traffic regulation around Intendencia Building.	Completed.
PROVINCIAL PROJECTS	
1. Donsol market (bronze tablet), Sorsogon	Completed.
2. Hagonoy market and tiendas, Bulacan	Do.
3. Florida Blanca market and tiendas, Pampanga	Do.
4. Septic vault, Laoag Normal School, Ilocos Norte	Do.
5. Iriga market and tiendas, Camarines Sur	Do.
6. Narvacan market and tiendas, Ilocos Sur	Do.
7. Pagsanjan market and tiendas, Laguna	Do.
8. Calamba market and tiendas, Laguna	Do.
9. Town plan of Lopez, Tayabas	Completed.
10. Proposed Vigan Capitol Building, Ilocos Sur	Drawings completed.
11. Mandawe market and tiendas, Cebu	Completed.
12. Malitbog market and tiendas, Leyte	Do.
13. Badoc market and tiendas, Ilocos Norte	Do.
14. Indang market, Cavite	Do.
15. Calumpang, Nagcarlan market and tiendas, Batangas.	Do.
16. Jaro town-layout and plaza, Iloilo	Do.
17. Silay market and tiendas, Occidental Negros	Do.
18. Capiz market (bronze tablet), Capiz	Do.
19. Cabanatuan market, Nueva Ecija	Do.
20. San Antonio market, Zambales	Do.
21. Saravia market, Occidental Negros	Do.
22. Cagayan capitol building, Misamis (Batangas Type)	Drawings sent for approval.
23. Pateros School, Rizal	Preliminary drawings completed.
24. Development of Bacolod-Santo Niño Wharf Road, Occidental Negros.	Drawings completed.
25. Muñoz market, Nueva Ecija	Do.
26. Calabanga market and tiendas, Camarines Sur	Do.
27. Buhi market and tiendas, Camarines Sur	Do.
28. Ilagan market (bronze tablet), Isabela	Completed.
29. Santo Domingo market and tiendas, Nueva Ecija	Drawings completed.



THE LEGISLATIVE BUILDING (UNDER CONSTRUCTION), MANILA

Projects assigned to Mr. Tomas Mapua, and to Mr. Antonio Toledo during the time that the former was on leave, showing status of each

Manila projects	Status
1. Boiler house, University of the Philippines	Working drawings for one story reinforced concrete building completed.
2. Guazon Memorial, Philippine General Hospital	Full-size details completed.
3. Pavilion for the School of Nursing, Philippine General Hospital.	Working drawings for wood building completed.
4. Pier head, No. 7	Full-size details completed.
5. Pier head, No. 7	Preliminary plans of end elevation made.
6. Philippine General Hospital	Drawings of iron grilles completed.
7. Training School	Preliminary drawings in preparation.
8. College of Medicine Annex	Preliminary plans completed.
9. Pier head, No. 5	Preliminary plans made.
PROVINCIAL PROJECTS	
1. Daet Provincial Building, Camarines Norte	Working drawings for the second story addition completed.
2. Davao Municipal Building, Davao	Working drawings for two-story reinforced concrete building and full-size details completed.
3. Iloilo Provincial Building, Iloilo	Working drawings for the second-floor addition completed.
4. Standard Provincial Hospital, (twenty to thirty beds).	Working drawings for one-story reinforced concrete building completed.
5. Standard Provincial Hospital (thirty to fifty beds)	Working drawings for two-story concrete building and kitchen completed.
6. Girls Dormitory, Tagbilaran, Bohol	Working drawings for two-story frame building completed.
7. Badoc tienda, Ilocos Norte	Working drawings completed.
8. Compostela Presidencia, Cebu	Do.
9. Garage and Laundry Pavilion, Scheme B, Standard Provincial Hospital.	Do.
10. Puericulture Building, Pagsanhan, Laguna	Preliminary plans for two-story wood building completed.
11. Sorsogon Fountain, Sorsogon	Preliminary plans completed.
12. Standard Provincial Post Offices, Schemes A and B	Preliminary plans completed and working drawings nearing completion.
13. Santa Cruz Courthouse, Laguna	Preliminary plans completed.
14. Dao Presidencia, Antique	Do.
PROVINCIAL PROJECTS—continued	
15. Martires Monument, Cabanatuan, Nueva Ecija	Preliminary plans completed.
16. Bonifacio Monument, San Fabian, Pangasinan	Do.
17. Cabanatuan Presidencia, Nueva Ecija	Do.
18. Kiangan Provincial Building, Mountain Province	Do.
19. Public midden shed, Cebu	Do.
20. Muñoz Agricultural School, Nueva Ecija	Development plan completed.
21. Bayombong Provincial Building, Nueva Vizcaya	Floor plans revised.
22. Dumaguete Provincial Building, Oriental Negros	Development plan completed.
23. San Manuel Presidencia, Tarlac	Location plan made.
24. Pozorrubio Presidencia, Pangasinan	Do.
25. Lila Presidencia, Bohol	Do.
26. Orphanage School, San Felipe Nery, Rizal	Do.
27. Calaca Presidencia, Batangas	Do.
28. Santander Presidencia, Cebu	Do.
29. Antipolo Presidencia, Rizal	Do.
30. Carmen Presidencia, Cebu	Do.
31. Dagupan Presidencia, Pangasinan	Do.
32. Poro Presidencia, Cebu	Do.
33. Albay Hospital, Albay	Do.
34. Infanta Presidencia, Tayabas	Do.
35. Antique Hospital, Antique	Do.
36. Sorsogon Hospital, Sorsogon	Do.
37. Bohol Provincial Building, Bohol	Full-size details made.
38. Laoag Capitol Building, Ilocos Norte	Retails of terraces, retaining wall and bronze tablet completed.
39. Tibiao Presidencia, Antique	Full-size details made.
40. Pasig Jail, Rizal	Do.
41. Capiz Market, Capiz	Drawing for bronze tablet made.
42. Rizal Monument, Laoag, Ilocos Norte	Do.
43. Guimbal Municipal Building, Iloilo	Do.
44. Cabanatuan High School, Nueva Ecija	Working drawings nearing completion. Preliminary drawings for one-story building completed.
45. Mabalacat Presidencia, Pampanga	Working drawings nearing completion.
46. Pili Presidencia, Camarines Sur	Location plan nearing completion.
47. San Fernando Waterworks, Pampanga	Drawing for bronze tablet nearing completion.
48. Tarlac Courthouse, Tarlac	Working drawings in preparation.
49. Mainit Bath house, Tayabas	Working drawings in preparation.
50. Tiwi Bath house, Albay	Preliminary drawings in preparation.

IRRIGATION DIVISION

A. D. WILLIAMS, *Chief Irrigation Engineer*

INSULAR IRRIGATION PROJECTS

There were nine irrigation projects under construction at the close of the fiscal year 1924. Of these projects, the Tagudin, Dipolog and Talavera River Irrigation Projects in Ilocos Sur, Zamboanga and Nueva Ecija Provinces, respectively, were completed during 1925. The Laoag–Vintar, in Ilocos Norte, Amburayan River in La Union, the South Side Angat System in Bulacan and the Sibalom–San Jose in Antique, could have also been completed but for the early rains which occurred during the month of May.

Funds totaling ₱1,729,595, from the sale of bonds under the provisions of Act 3015, were released during the year for continuing construction work on projects under way; no new projects having been approved for construction.

The status of all insular projects which have been financed from bond issue funds, or approved for construction since the reorganization of the division in 1918, is given in the following tables:

Project	Province	Irrigable area	Estimated cost	Allotments authorized	Total expenditures and liabilities	Percentage of work completed
Trinidad	Mountain Province	200.0	₱40,000	₱40,000	₱40,000.00	Completed (1921).
Santa Barbara	Iloilo	4,985.6	692,000	692,000	692,000.00	Completed (1922).
Dingras	Ilocos Norte	1,009.5	130,000	130,000	130,000.00	Completed (1922).
Baruyen	do.	810.7	89,000	89,000	89,000.00	Completed (1923).
Naic	Cavite	676.0	300,000	292,000	292,000.00	Completed (1923).
Aganao	Iloilo	5,882.9	917,000	917,000	917,000.00	Completed (1923).
Talavera River	Nueva Ecija	7,716.0	1,108,000	1,108,000	1,108,000.00	Completed (1925).
Tagudin	Ilocos Sur	1,089.0	375,000	375,000	375,000.00	Completed (1925).
Dipolog	Zamboanga	1,060.0	110,000	128,250	128,250.00	Completed (1925).
Amburayan	La Union	4,500.0	950,000	4,156,000	1,120,769.17	91 per cent completed.
Angat River	Bulacan	25,000.0	4,500,000	1.664,000	4,501,411.26	85 per cent completed.
Laoag–Vintar	Ilocos Norte	6,000.0	1,000,000	1,360,000	1,161,668.72	86 per cent completed.
Sibalom San Jose	Antique	4,000.0	500,000	385,000	342,481.30	84 per cent completed.
San Miguel Extension	Tarlac	4,500.0	380,000	300,000	288,955.01	67 per cent completed.
Peñaranda River	Nueva Ecija and Bulacan	18,000.0	2,250,000	1,589,185	1,960,961.07	5 per cent completed.
Lanao	Bataan	160.0	30,000	5,000	3,424.00	Abandoned.

Of the total allotment authorized to date, ₱9,946,935 have been taken from the twenty-million-peso bond issue authorized by Act 3013, and ₱2,619,500 from current revenues of the Government.

COMPLETED PROJECTS

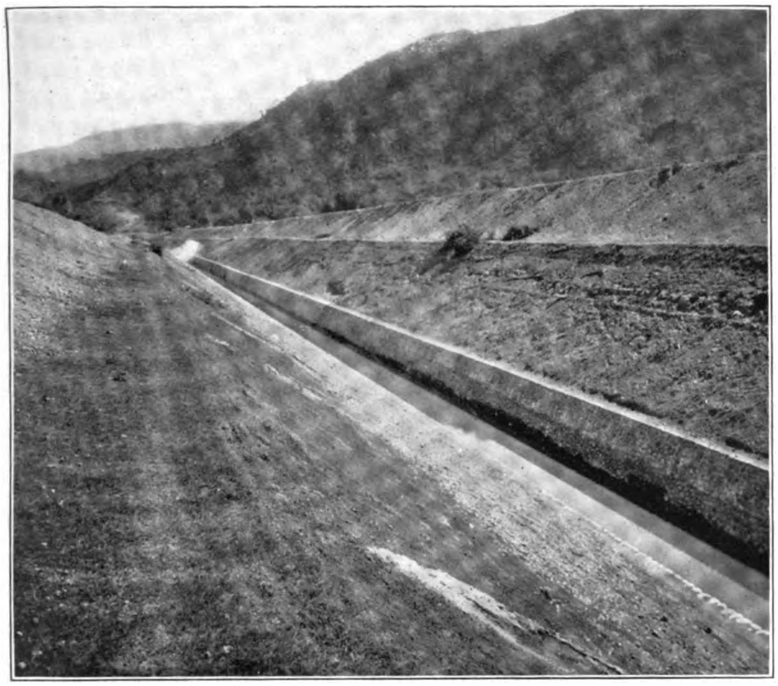
Talevera River Irrigation Project.—The last unit of this project was completed in time to furnish water to the total irrigable area of 7,716.39 hectares for the 1925 rice crop. An excellent yield was obtained while adjacent unirrigated lands produced a very short crop.

At the request of interested landowners, an extension of this project to cover approximately 1,500 hectares has been approved for construction and it is expected that construction work can be completed before the next rice planting season.

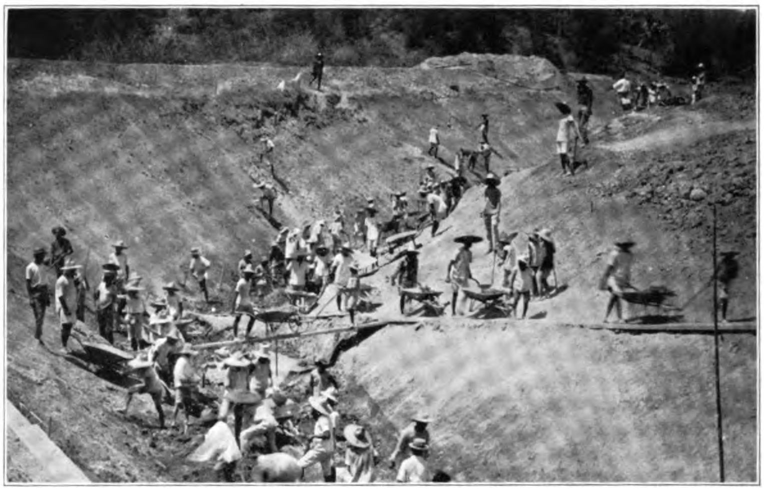
Tagudin Irrigation Project.—This project was practically completed during 1924. A continuous supply of water was available for the entire area served with the result that excellent crops were produced.

PROJECTS UNDER CONSTRUCTION

Amburayan River Irrigation Project.—This project would have been completed in July, 1925, but for the early typhoons during May and June. The work on the excavation and lining of the tunnel as well as the placing of rubble masonry paving in the Main Canal adjacent to the tunnel were discontinued the latter part of June on account of high water. Construction work was resumed in the early part of November and barring unforseen events, the project will



Main Canal, Lined Section, Amburayan River Irrigation System, La Union Province



Main Canal, Below Headworks, Sibalom Irrigation System, Antique Province

be completed as a whole on or before March 30, 1926, and officially opened in time for the next rice planting season.

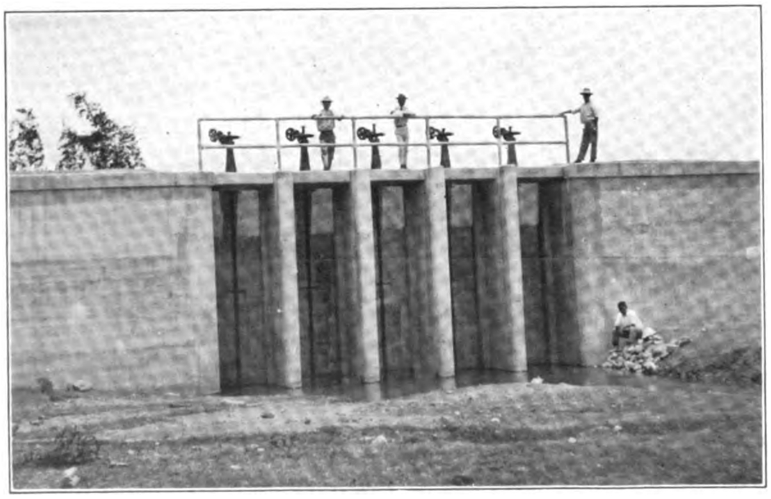
Angat River Irrigation Project.—The diversion works were completed in May, 1925, and water could have been delivered to a large part of the land under the South Side canal system but for the damages on the main canal resulting from unusually high flood on the Angat River during the month of July. The canal structures for the South Side system were 90 per cent complete at the end of the year and are to be finished before the next rice planting season. The official opening of this part of the project is scheduled for May 1, 1926.

The excavation on the North Side canal system is 80 per cent complete, and in all probability will be finished by July, 1926. Good progress has also been made on the canal structures and it is believed that the project as a whole can be completed during 1926.

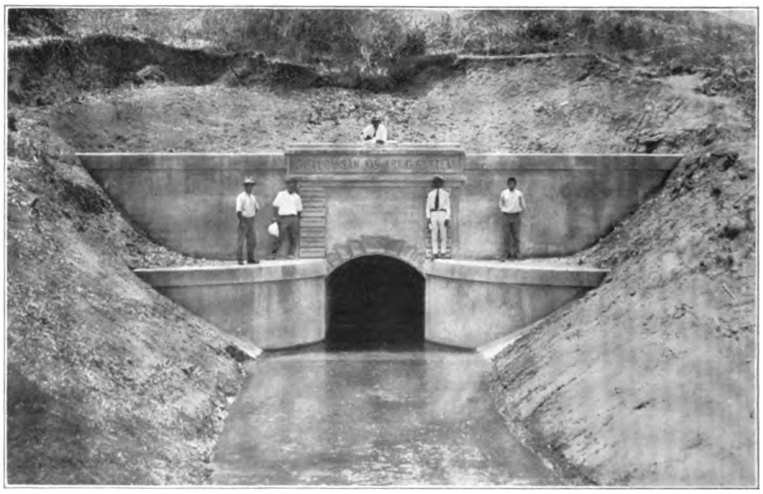
The flood of July 24, 1925, on the Angat River is said to have been the highest known by local residents during the last fifty years. The river overflowed its banks at a number of places and did considerable damage to the canal systems on both sides of the river. To prevent the reoccurrence of this, the South Protection Dyke is being extended 6 kilometers upstream. A protection dyke on the North Side of the river has also been planned and construction work is pending the financing of same since it has been decided that this dyke should not be entirely paid for from irrigation funds.

Sibalom–San Jose Irrigation Project.—The contractor for the canal structures made good progress during the first three months of the year, but his work was interrupted by early rains which were more or less continuous in that locality until November, when he was again able to resume the work. The contractor's time for completion expired on December 31, 1925, but in view of the difficulties encountered, an extension up to March 30, 1926, has been authorized. The contractor for the excavation of the Main Canal and laterals did not make satisfactory progress due to scarsity of laborers. The project was 84 per cent completed at the end of the year and should be finished on or before July 1, 1926.

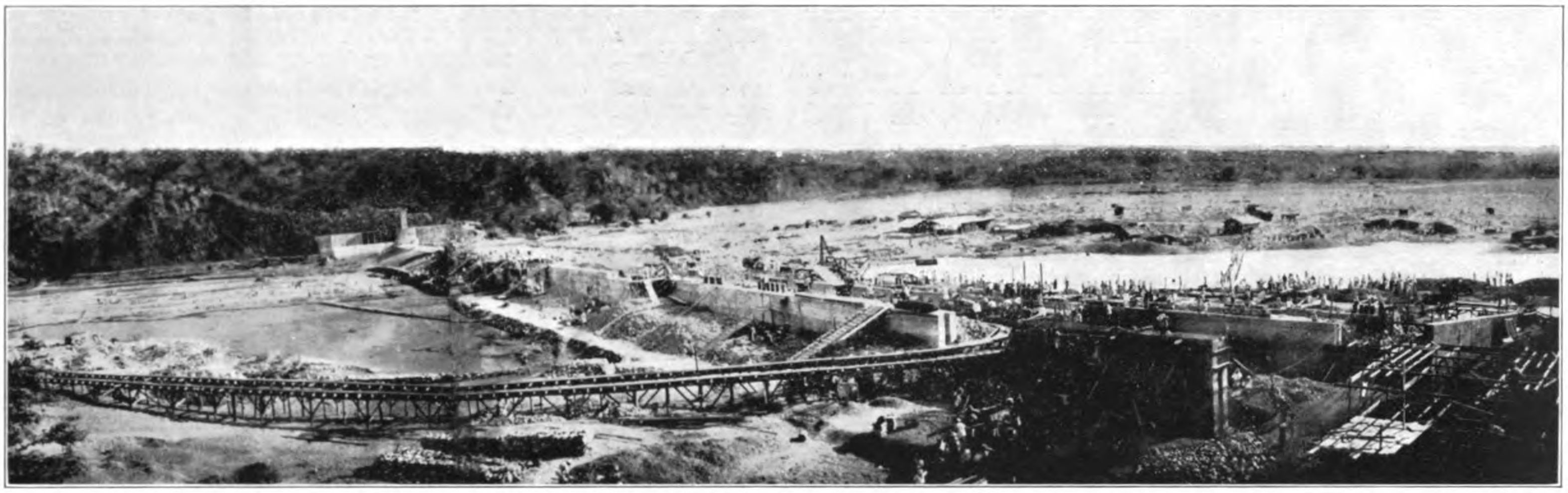
San Miguel Extension Project.—Contracts (1) for the construction of the earth protective dyke and the excavation of canals and laterals and (2) for the construction of the canal structures were awarded to Mr. Sotero Baluyot, Contractor of San Fernando, Pampanga, on January 29 and July 24, 1925, respectively. Good progress was made during the dry season and the early part of the rainy season. The amount of work accomplished indicates that this project as a whole should be completed before July 1, 1926.



Headworks, Sibalom Irrigation System, Antique Province



Main Canal, Sibalom Irrigation System, Antique Province



Diversion Works, Laoag-Vintar Irrigation System, Ilocos Norte Province
(Under construction)

Peñaranda River Irrigation Project.—The contract for the construction of the diversion works was awarded to Mr. F. T. Ryan on June 9, 1925, but very little work could be accomplished during the rainy season or until the month of November.

The typhoon of July 24 and 25, 1925, also caused the highest water ever recorded on the Peñaranda River and disclosed the necessity of lengthening the weir from 250 to 310 meters and raising the height of proposed protection dykes at each end of the weir by one meter. It is estimated that this will increase the estimated cost of the project by at least ₱150,000.

The contract for the excavation of the Main Canal and laterals was awarded to Mr. Sotero Baluyot in January, 1925, but very slow progress was made because of the difficulties experienced in securing laborers in that locality. The total amount of work accomplished by the contractor up to December 31, 1925, was only 3 per cent.

Contracts for the construction of the canal structures were awarded to Mr. F. T. Ryan for Zone I and to Mr. S. Naganye for Zones II and III, on November 7 and December 4, 1925, respectively.

Laoag-Vintar Irrigation Project.—The construction of the diversion works under contract with Messrs. Gordon and Haley had been almost completed when a small flood occurred on May 23, 1925, and did considerable damage. The South headgate structure was completed; the main body of the dam was completed but for forty-one concrete paving blocks and a 27-meter section of the talus; the North Headgate Structure was well under way with a portion of the upstream retaining wall uncompleted and a gap of about 15 meters in the earth dyke immediately adjacent to the upstream retaining wall North Headgate Structure. A flood on June 9, 1925, overtopped the uncompleted section of the dyke at the north end of the weir and destroyed 100 meters of the same and seriously undermined the North Headgate Structure. The floods of July 7–14, 1925, continued the work of destruction by completely destroying the North Headgate Structure and causing the failure of over one-half of the weir by undermining.

A Committee of Engineers, composed of Messrs. W. J. Grodske, Acting Chief Designing Engineer; Luis Francisco, Division Engineer; and H. O. Bauman, Project Engineer was appointed to investigate the causes of the failure with a view to fixing the responsibility for losses and damages. The Committee found the contractors responsible for losses and damages amounting to approximately ₱170,000, and the Government for about ₱40,000.

Messrs. Gordon and Haley practically abandoned their work just prior to the July floods and they having refused to resume work after the rainy season, their contract was finally annulled on December 9, 1925. The completion of the project was immediately undertaken by administration and it is planned to complete construction work before the next rainy season and to officially open the project by July 1, 1926.

OPERATION AND MAINTENANCE

The following table gives pertinent information regarding completed insular irrigation systems which are operated and maintained under the supervision of the division in accordance with the provisions of the Irrigation Act:

System	Province	Cost of construction	Irrigable area	Annual installment per hectare	Cost of operation maintenance and Insurance per hectare 1925	Total charges per hectare 1925	Construction work completed
			Hectares				
Pilar	Bataan	₱27,606.70	170.14	₱8.65	₱6.29	₱14.94	1912
San Miguel	Tarlac	1,089,000.00	2.596.98	...	3.14	6.00	1913
Santa Barbara	Iloilo	692,000.00	4,959.78	7.01	3.19	10.20	1922
Dingras	Ilocos Norte	130,000.00	1,014.61	6.51	3.70	10.21	1922
Baruyen	do.	89,000.00	551 44	5.55	3.17	8.72	1923
Talavera River	Nueva Ecija	1,108,000.00	6,547.35	6.02	3.18	9.21	1923
Do	do.	...	1,169.04	[c]2.50	...	[c]2.50	1924
Aganao River	Iloilo	917,000.00	6,196.79	8.42	3.22	11.64	1924
Tagudin	Ilocos Sur	375,000.00	1,080.00	17.40	3.43	20.83	1925
Dipolog	Zamboanga	128,250.00	1,060.00	6.33	3.21	9.54	1925
Trinidad	Benguet	40,000.00	200.00	...	(a)	...	1921
Naic	Cavite	292,000.00	675.97	21.82	(b)	...	1923
Total	...	4,887,856.70	26,222.10	...			

[a] System operated and maintained by the Superintendent, Trinidad Farm School.
[b] System operated and maintained by the Bureau of Lands.
[c] Charge of ₱2 50 is for 1,169.04 hectares of land formerly irrigated by an old irrigation system from the Talavera River.

The total area irrigated in 1925 was 26,220 hectares as compared with 20,441, in 1924, or an increase of 5,780 hectares.

In order to give further assistance to farmers under completed systems with a view to increasing production, an experienced Agricultural Inspector has been employed and is getting very encouraging results.

IRRIGATION PROJECTS UNDER CONSIDERATION

Topographic surveys were completed during 1925 of Tarlac River Irrigation Project, Tarlac Province, covering a total area of over 40,000 hectares.

The following table gives the location, approximate irrigable area, and status of the more important projects under consideration:

Province	Project	Irrigation area	Status
		Hectares	
Abra	Abra River	4,000	Awaiting investigation.
Albay	Quinali–Lake Bato	6,000	Do.
Do	Malinao–Tabaco	600	Do.
Camarines Norte	Daet	2,000	Topographic survey completed.
Do	Talisay–Indan	3,000	Do.
Camarines Sur	San Jose–Hagonoy	5,000	Awaiting investigation.
Do	Pauili Valley	5,000	Topographic survey completed.
Do	Barit River	2,000	Awaiting investigation.
Bataan	Dinalupihan	2,500	Do.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
Do	Mambusao	1,000	Preliminary investigation, 1911.
Do	Macato–Malinao	1,200	Do.
Do	Ibahay	500	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Investigation in progress.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
Do	Candon	1,000	Recommended for construction, Act 2755.
Do	Santa Cruz	1,000	Preliminary survey completed.
Do	Santa Lucia and Candon	1,900	Recommended for construction, Act 2755.
Cebu	Balamban River	1,200	Awaiting investigation.
Batangas	Batangas	1,000	Investigation in progress.
Do	Balayan	300	Do.
Do	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Topographic survey completed.
Do	Pototan	2,300	Survey and preliminary design made.
Do	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Topographic survey completed.
La Union	Balaoan	1,200	Abandoned.
Do	Bacnotan	2,000	Topographic survey completed.
Do	Agoo–Tubao	2,000	Awaiting investigation.
Do	Naguilian	1,000	Preliminary survey completed.
Do	Rosario	1,000	Topographic survey completed.
Do	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	1,000	Topographic survey completed.
Do	Palo	1,000	Preliminary investigation completed.
Do	Dagami–Tanauan	14,000	Awaiting investigation.
Do	Bato–Hilongos	3,000	Do.
Mindoro	Bucayao River	2,000	Do.
Nueva Ecija	Pampanga River	25,000	Topographic survey completed.
Nueva Vizcaya	Murong	1,200	Do.
Occidental Negros	Binalbagan-Himamaylan	3,000	Do.
Do	Bago	20,000	Do.
Do	Silay	5,000	Awaiting investigation.
Oriental Negros	La Granja Extension Station.	200	Investigation in progress.
Do	Tanjay	800	Awaiting investigation.
Do	Tolong	3,000	Preliminary investigation made.
Pampanga	Porac	1,000	Topographic survey completed.
Do	Bamban	3,000	Do.
Do	Gamain	5,000	Do.
Pangasinan	Agno	40,000	Topographic survey completed.
Do	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do	San Fabian	4,000	Do.
Do	Banila	5,000	Topographic survey completed.
Rizal	Mariquina Valley	5,000	Do.
Do	Pililla	180	Recommended for construction, Act 2755.
Do	Morong	590	Do.
Tarlac	Tarlac	25,000	Topographic survey in progress.
Tayabas	Mayao	2,500	Awaiting investigation.
Zambales	San Marcelino	4,000	Topographic survey completed.
Do	Toton–Lanom	600	Preliminary survey completed.
Do	Iba	400	Do.
Total		312,840	

MUNICIPAL IRRIGATION PROJECTS

A list of projects approved for construction and on which work is still pending due to lack of funds will be found in the previous annual report of the Bureau.

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the Division made 1,693 discharge measurements at permanent gaging stations, and 7 measurements at temporary stations during 1925. Six gaging stations were abandoned and 6 new stations established, leaving 147 permanent stations at the end of the year where daily gage height records are kept and frequent discharge measurement taken. Records were also kept for 32 rain gages established in localities distant from Weather Bureau's gages.

WATER RIGHTS

There were received during the year a total of 145 new applicants for water rights, 139 of which were for irrigation, and 6 for power development purposes. A total of 139 applications were finally acted upon, 115 of which were granted and 24 disapproved by the Honorable, the Secretary of Commerce and Communications upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 17,618.00 hectares of land. Of the 6 applications for the development of power filed in 1925, five applications for power development were approved for developing a maximum of 2,634 horse power. Two streams were designated for the adjudication of existing water rights during the year 1925.

Surveys were completed and maps prepared of the lands having water rights on 11 streams with an aggregate area of 56,711 hectares which is an increase of some 32,300 hectares over the work of the preceding year. The streams which are now pending adjudication are given in the following tables.

Surveys have been completed and maps prepared on the following streams:

Stream	Province	Number of diversion ditches	Length of main canal in meters	Number of municipalities affected	Approximate number of hectares irrigated
O'Donnel–Moriones and Tarlac River.	Tarlac	2	4,000	4	10,000
Ange and Gogo Rivers	Pampanga	25	970	4	5,200
Porac River	do.	14	12,825	4	2,326
Gumain River	do.	7	27,236	4	2,820
Caulaman River	Pampanga and Bataan.	3	31,643	4	4,065
Banila River	Pangasinan	50	10,000	4	25,500
Andulan or Burubor River	do.	30	1,000	2	1,300
Bued or Natayangan River	Nueva Ecija and Pangasinan.	10	1,000	2	2,500
Parasapas Creek	Pangasinan	2	500	2	1,500
Paoay Lake	Ilocos Norte	1	3,000	2	500
Malabago or Anondaan River	Pangasinan	5	3,000	4	1,000
Total					56,711

Surveys are in progress with surveying parties in the field on the following streams:

Stream	Province	Municipality affected	Approximate area of land irrigated
			Hectares
Lubuac Estero	Ilocos Norte	Sarrat	300
Burnay River	do.	Solsona and Dingras	1.500
Nagdasaagan River	do.	Piddig	800
Maoguing-oging River	do.	Dingras	500
Padsan River	do.	Banna	1,900
Maolo River	Pangasinan	Sison and Pozorrubio	2,500
Gogo and Bugo Esteros	Tarlac	Concepcion	3,000
Parna River	Pampanga and Tarlac	Mabalacat, Bamban and Concepcion.	8,000
Total			15,500

Sluice and Check Gates, Settling Basin and Wasteway, Amburayan River Irrigation System, La Union Province

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream	Province	Municipality affected	Approximate area of land irrigated
			Hectares
Nagubuuban Estero	Ilocos Norte	Badoc	300
Banglayan River	Ilocos Sur	Narvacan	2,200
Codoog or Barongubong River.	....do.	Narvacan and Nagbukel.	1,000
Nasisi River	Albay	Ligao and Oas	1,000
Ynarihan River	Camarines Norte	Naga, Magarao and Cabalanga.	1,200
Pias Estero	Tarlac	Moncada and San Manuel.	5,000
Immanduyan or Aloragat River.	Pangasinan	Mapandan, Manaoag, Binalonan, Pozorrubio and Sison.	5,000
Del Carmen Creek	Pampanga	San Fernando and Mexico.	5,000
Matua Creek	....do.	Santa Rita, Guagua and Bacolor.	800
Labasin and Balaquin River	Tayabas and Laguna	Tiaong, Dolores and San Pablo.	300
Total			21,800

WATERWORKS

The Division prepared plans and specifications for 16 municipal waterworks projects on which construction work was started during 1925. These projects will furnish potable water to a total population of 51,430 at an estimated cost of ₱436,000. Preliminary designs and estimates were also made for 9 provincial and municipal waterworks projects, most of which are to be financed from loans. These projects will supply 29,500 people at an estimated cost of ₱403,000.

Construction work was completed by district engineers on 10 waterworks projects started during the previous year, leaving 40 projects under construction at the end of the year. The 10 completed projects cost ₱509,755.74 and serve a total population of 36,290 while the 40 projects still under way are estimated to cost ₱1,420,000 and will provide a potable water supply for 130,300 people.

There are 90 waterworks projects under consideration which contemplate furnishing water to a total population of 365,000 and are estimated to cost approximately ₱6,300,000. As soon as the municipalities concerned are able to finance these projects, construction work may be undertaken, excepting a few projects which require further investigation.

There are in the Archipelago 132 municipal and provincial waterworks, excluding the Manila Metropolitan Water System, thus far completed which furnishes potable water to a total population of 415,000 and have cost ₱5,033,348.82.

The status of all waterworks projects to date is shown in the accompanying lists as follows:

1. Waterworks projects under construction.
2. Waterworks projects completed.
3. Waterworks projects under consideration.

RIVER CONTROL PROJECTS

Funds totalling ₱80,000 were released during the year from funds authorized by Act 3213 for the construction of the Bautista Protection Dyke, Pangasinan; for repairs to the Batangas Spur Dykes and Balayan Dyke, Batangas; for the maintenance and repairs of Pampanga River Dyke, Pampanga; and for the maintenance of the Tarlac River Dyke, Tarlac and Agno River Dyke and cut-off channel in Bayambang, Pangasinan.

The work of the Division on these projects was confined to field investigation and the preparation of plans and estimates. Construction work was carried out under the supervision of district engineers.

Chute—Main Canal, Amburayan River Irrigation System, La Union Province

The Division had under consideration, during the past year, 56 river control projects as shown in the following table:

Province	Municipality	River	Type of work	Estimated cost or fund available	Status
Abra	Bucay	Patoc Creek	Construction of headgate		Preliminary studies.
Do.	Bangued	Abra	Bank revetment		Preliminary investigation.
Albay	Libon	Calacran	Channel diversion		Preliminary plans.
Do.	Malinao	Malinao	Spur dyke	₱50,000	Preliminary investigation.
Do.	Guinobatan	San Francisco	Bank revetment	9,300	Preliminary plans.
Antique	Barbasa	Binangbang	do.		Preliminary investigation.
Do.	Colasi	Bacong	Channel diversion	40,000	Preliminary investigation and plans.
Do.	Tibiao	Tibiao	Earth dyke		Preliminary report.
Batangas	Balayan	Binambang	do.	30,000	Completed.
Do.	Batangas	Calumpang	Spur dykes	3,000	Do.
Do.	do.	Pansipit	Earth dyke	5,500	Awaiting construction.
Cagayan	Lal-lo	Cagayan	Bank revetment	38,000	Preliminary investigation.
Camarines Norte	Capalonga	San Francisco	(See Albay)		Preliminary plans.
Camarines Sur	Goa	Langas	Channel improvement		Preliminary studies.
Cebu	Barili	Mantayupan	Levee around town	30,000	Do.
Do.	Carcar	Carcar	do.	35,000	Do.
Do.	Danao	Danao	Earth dyke	4,000	Completed.
Do.	Argao	Argao	Protection dyke		Preliminary investigation.
Ilocos Norte	Solsona	Solsona	Bank Revetment		Preliminary investigation.
Do.	Vintar	Vintar	do.		Preliminary studies.
Ilocos Sur	Vigan	Govantes	Earth dyke and roadway	72,000	Awaiting construction.
Do.	Magsingal	Parsua	Bank revetment		Preliminary investigation.
Iloilo	Cabatuan	Cabatuan	do.	8,000	Awaiting construction.
Do.	do.	Tigum	Earth dyke		Preliminary investigation.
Do.	Miagao	Miagao	Bank revetment		Do.
Lanao	Iligan	Mandulog	do.		Do.
La Union	Agoo	Agoo			Do.
Do.	Bangar	Amburayan	Causeway	90,000	Awaiting construction.
Do.	Caba	Caba			Preliminary investigation.
Do.	Balaoan	Maluyo	Channel diversion		Completed. Constructed in connection with Amburayan River Irrigation project.
Do.	Luna	Busilac	do.		Preliminary investigation.
Do.	Santo Tomas	Manacliw			Do.
Leyte	Alang-alang	Mainit	Bank revetment		To be constructed from road funds.
Do.	Biliran	Cabugayan			Preliminary investigation.
Nueva Ecija	Cabanatuan	Rio Grande			Do.
Nueva Vizcaya		Magat			Do.
Manila	Manila	Pasig	Flood canal		Do.
Occidental Negros	Binalbagan	Binalbagan	Channel diversion and dyke		Preliminary plans.
Do.	Cadiz	Cadiz	Bank revetment and jetty		Preliminary report.
Do.	Ilog	Ilog	Bank revetment and dyke		Preliminary studies.
Oriental Negros	Tanjay	Tanjay	Improvement of dyke		Do.
Do.	do.	La Libertad			Preliminary investigation.
Pampanga	Macabebe and Masantol		Reconstruction of dyke		Preliminary studies.
Do.	Santa Rita, Betis, Bacolor, and Guagua.	Potrero or Pasig	Channel diversion		Topographic survey completed.
Do.	Arayat, San Luis, San Simon and Apalit.	Pampanga	Maintenance and improvement existing dyke on right bank revetment.	15,000	
Do.	Sexmoan	Pasag			Preliminary investigation.
Pangasinan	Asingan	Agno	Earth dyke	50,000	Completed.
Do.	Bayambang	do.	Earth dyke and cut-off channel	50,000	Do.
Do.	Bautista-Alcala	do.	Earth dyke		Awaiting construction.
Do.	Rosales	Banila	Channel diversion	100,000	Do.
Do.	Tayug	Ambayuan, Viray and Dipalo.			Preliminary investigation.
Samar	Catarman	Catarman	Repairs to existing spur dykes	12,000	Under way.
Sorsogon	Bacong	Rangas	Protection dyke		Preliminary investigation.
Tarlac	Tarlac	Tarlac	Construction of apron for Tarlac dyke.	12,000	Completed.
Do.	San Miguel	O'Donnell	Protection dyke	2,000	Do.
Tayabas	Sariaya	Lagnas and Sariaya	Channel diversion and improvement	5,000	Under way.

TABLE H.—*Waterworks projects under construction*

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Albay	Guinobatan [a]	Gravity	5,000	₱45,000.00	₱25,000.00	₱12,500.00
Antique	Bugasong [a]	do.	2,500	21,000.00	10,750.00	7,000.00
Batangas	Bauan	Pumping	4,700	65,000.00	40,000.00	20,000.00
Do	Rosario [a]	do.	5,000	18,000.00	12,000.00	6,000.00
Do	Talisay [a]	Gravity	2,130	21,000.00	14,000.00	7,000.00
Bohol	Calape [a]	do.	2,600	30,000.00	20,000.00	10,000.00
Do	Inabanga [a]	do.	4,000	40,200.00	20,000.00	16,700.00
Do	Loboc [a]	do.	3,000	22,000.00	10,000.00	10,000.00
Do	Loon	do.	5,000	33,000.00	22,000.00	11,000.00
Bulacan	Malolos	Pumping	6,000	120,000.00	75,000.00	37,500.00
Camarines Norte	Paracale [a]	Gravity	2,500	7,800.00	4,000.00	2,400.00
Cavite	Cavite	Pumping	10,910	90,000.00	49,000.00	37,500.00
Cebu	Carcar (Improvement)	Gravity	4,000	48,000.00	17,000.00	6,000.00
Do	Dalaguete Extension	do.	3,500	27,000.00	18,000.00	9,000.24
Laguna	Alaminos	do.	1,130	30,000.00	20,000.00	10,000.00
Do	Calamba	Pumping	7,000	85,000.00	50,000.00	25,000.00
Do	Lilio [a]	Gravity	4,500	42,000.00	25,000.00	14,000.00
Do	Luisiana [a]	do.	4,500	48,000.00	20,000.00	16,000.00
Do	Magdalena	do.	3,000	68,000.00	42,400.00	21,210.79
Do	Rizal [a]	do.	3,000	27,000.00	18,000.00	9,000.00
La Union	San Fernando	do.	5,000	84,000.00	49,000.00	32,000.00
Leyte	Baybay	do.	8,000	66,000.00	44,000.00	25,000.00
Marinduque	Torrijos [a]	do.	5,000	21,000.00	14,000.00	8,000.00
Mountain Province	Apayao (Kabuyao)	do.	800	7,000.00	5,000.00	
Do	Kiangan	do.		7,000.00		6,643.40
Do	Lubuagan	do.	1,200	8,000.00	5,000.00	
Nueva Ecija	Muñoz Central Luzon Agricultural School [a]	Pumping	1,000	10,000.00	10,000.00	
Oriental Negros	Dawin [a]	Gravity	1,500	23,000.00	13,000.00	10,000.00
Palawan	Bacuit	do.	1,000	3,200.00	2,500.00	700.00
Do	Balabac Extension	do.	800	5,000.00	3,200.00	
Do	Barrio Bintuan	do.	1,000	5,500.00	3,700.00	1,000.00
Do	Culion	Gravity and pumping	5,000	35,000.00	35,000.00	
Do	Cuyo	do.	800	10,000.00	6,650.00	3,000.00
Do	Oton	Gravity	330	5,000.00	3,000.00	
Do	Puerto Princesa-(Reconstruction)	Pumping	400	3,300.00	2,200.00	
Pangasinan	San Manuel [a]	Gravity	4,000	36,000.00	20,000.00	18,000.00
Tayabas	Candelaria	do.	3,500	59,000.00	35,000.00	20,000.00
Do	Mulanay [a]	do.	1,200	24,000.00		11,180.00
Do	Tiaong	do.	1,800	45,000.00	26,000.00	15,000.00
Zambales	San Antonio	do.	4,000	75,000.00	25,000.00	(b)
Total			130,300	1,042,000.00	814,400.00	438,334.43

[a] Projects begun in 1925.

[b] One-third coast guaranteed by municipal council and provincial board.

TABLE I.—*Waterworks projects completed*

Province	Municipality	Population served	Cost	System	Capacity of system, gallons per day
Abra	Bangued	6,600	₱130,755.85	Gravity	180,000
Albay	U. S. Reservation Regan Barracks and Legaspi.	5,000	60,000.00	Crude oil and steam pumping.	259,200
Antique	San Jose	4,000	41,846.74	Pumping	47,520
Batangas	Balayan	2,000	7,353.92	Gravity	100,800
Do	Batangas	6,147	71,529.96	Pumping	144,000
Do	Cuenca	2,500	5,000.00	Gravity	5,040
Do	Lemery	7,200	47,132.84	Pumping	200,000
Do	Lipa	5,000	103,065.87	do.	172,800
Do	San Jose	4,000	44,099.45	Gravity	216,000
Do	Santo Tomas (Kalaw).	1,910	27,108.65	do.	50,400
Do	Taal	5,000	91,188.34	Pumping	187,200
Do	Taal Extension	4,000	57,220.41	Pumping	80,000
Do	Tanawan [a]	2,500	55,615.02	Gravity	45,000
Bohol	Dauis	840	5,100.00	do.	77,760
Do	Duero	2,000	10,823.56	do.	86,400
Do	Jagna	3,000	24,115.26	do.	43,200
Do	Laoay	3,000	18,968.72	do.	144,000
Do	Mabini	1,300	6,750.00	do.	72,000
Do	Tagbilaran	5,245	13,837.47	Pumping	77,760
Do	Tubigon	4,800	37,094.06	do.	100,800
Bukidnon	Delirio	600		Gravity	4,320
Do	Balaybalay	1,300	11,641.16	do.	20,160
Do	San Luis	500	650.00	do.	
Bulacan	Marilao	(b)	22,101.50	do.	
Do	Hagonoy	2,789	7,564.87	do.	50,400
Do	Sibul San Miguel.	(c)	256,000.00	do.	
Camarines Norte	Mambulao	(d)	1,200.00	do.	
Capiz	Capiz	6,400	13,541.92	Concrete tank.	264,170 Gallon tank.
Cavite	Indang [a]	3,000	38,092.48	Pumping	144,000
Do	Mendez-Nuñez	1,600	60,700.00	Water wheel driven pump.	57,600
Do	Silang [a]	4,000	35,303.29	Gravity	100,000
Cebu	Barili	2,067	26,958.28	do.	61,200
Do	Carcar	4,463	64,004.45	do.	216,000
Do	Catmon	1,624	16,399.56	Pumping	
Do	Cebu	65,000	510,540.13	Gravity	806,400
Do	Cebu-Labangon	(e)	16,000.00	do.	576,000
Do	Cebu-Sambag	do.	35,789.18	Pumping	187,200
Do	Cordova	1,191	4,810.74	Rain tank	30,000 Gallon tank.
Do	Daan-bantayan.	579	5,672.99	do.	30,000
Do	Dalaguete	2,480	14,941.15	Pumping	36,000
Do	Dumanjug	1,500	35,638.29	do.	187,200
Do	Ginatilan	2,669	13,404.80	Gravity	43,200

TABLE I.—*Waterworks projects completed*—Continued

Province	Municipality	Population served	Cost	System	Capacity of system, gallons per day
Cebu	Malabuyoc	1,500	₱14,941.15	Gravity	104,544
Do	Moalbual	2,108	14.297.27	do.	54,720
Do	Opon	1,500	36,568.44	Pumping	144,000
Do	Oslob, Barrio Mainit.		2,000.00	Gravity	
Do	Pilar	702	5,019.21	do.	14,400
Do	Poro	1,000	8,873.63	do.	21,600
Do	Naga	3,233	6,800.00	do.	79,200
Do	Naga Extension	(f)	4,552.48	do.	
Do	Samboan [a]	2,741	7,514.11	do.	49,248
Do	Barrio San Isidro, San Francisco.[a]	650	1,388.13	do.	34,560
Do	San Francisco	1,243	6,200.00	do.	10,000
Do	Sibonga	2,661	35,300.00	do.	63,360
Do	Tuburan	3,900	55,335.55	do.	120,960
Do	Tudela	851	8,263.29	do.	24,480
Cotabato	Parang	600	9,600.00	Hydraulic ram.	21,600
Davao	Davao	6,000	137,195.14	Gravity	86,400
Ilocos Sur	Vigan	8,440	127,399.52	do.	201,600
Isabela	Ilagan	(g)			
Laguna	Bay	1,471	2,767.72	Gravity	86,400
Do	San Pablo	7,000	89,455.82	do.	576,000
Do	Santa Cruz	6,000	92,692.43	Pumping	352,800
Do	Majayjay	3,200	38,686.06	Gravity	187,200
Do	Nagcarlan	2,500	36,034.42	do.	180,000
Do	Pagsanjan	4,044	73,782.67	Pumping	233,280
Marinduque	Boac	1.000	6,653.00	do.	57,600
Do	Gasan	1,400	22,124.97	do.	144,000
Do	Barrio Malbog, Buenavista.	1,000	13,614.29	Spring and bath house.	61,920
Do	Mogpog	1,280	10,535.69	Gravity	18,288
Do	Santa Cruz	2,560	20,695.23	do.	158,400
Mindoro	Abra de Ilog	350	4,743.74	do.	14,400
Do	Calapan	2,500	29,743.47	Pumping	57,600
Misamis	Balingasag	1,514	8,924.14	Gravity	57,600
Do	Cagayan	3,000	50,408.82	Pumping	86,400
Do	Mahinog	5,727	6,000.00	Gravity	
Do	Mambajao	14,446	30,000.00	do.	
Do	Sagay	6,321	800.00	do.	
Mountain Province.	Baguio	6,000	220,565.10	Pumping and gravity.	350,000
Do	Cervantes	800	7,565.07	Gravity	
Do	Teachers' Camp and Country Club.	1,500	Not available.	do.	216,000
Do	Mansion House	100	do.	Pumping	

[a] Projects completed in 1925.

[b] Bath house.

[c] Spring improvement.

[d] No data.

[e] Part of Cebu.

[f] Part of Naga.

[g] Constabulary.

TABLE I.—*Waterworks projects completed*—Continued

Province	Municipality	Population served	Cost	System	Capacity of system gallons per day
Mountain Province	Trinidad Farm School.	300	₱19,330.93	Gravity	36,000
Do.	Trinidad Stock Farm.	60	2,000.00	do.	8,640
Nueva Ecija	Cabanatuan	6,000	111,302.49	Pumping	100,000
Oriental Negros	Basac	365	No record	Hydraulic ram.	
Do.	Barrio Siquijor	494			
Do.	Dumaguete[a]	4,000	84,131.43	Pumping	288,000
Do.	Talingting Larena.	2,890	5,025.00	Gravity	6,480
Do.	Lazi	2,300	6,980.77	do.	
Do.	Luzuriaga	2,500	12,317.44	do.	269,280
Do.	Maria	1,000	1,353.05	do.	
Do.	Maria Extension.	(h)	2,677.41	do.	7,400
Do.	Siquijor Pob.	1,587	18,000.00	do.	
Palawan	Coron	1,150	7,844.63	Pumping	20,160
Do.	Puerto Princesa	716	10,268.45	do.	28,800
Pampanga	Angeles	6,708	12,318.52	Steam pumping.	61,920
Do.	Arayat[a]	3,840	35,180.95	Gravity	144,000
Do.	San Fernando	1,000	1,050.02	Pumping	86,400
Pangasinan	Alcala	2,200	3,000.00	Gravity	129,600
Do.	Bani	2,000	12,411.86	do.	86,400
Do.	Bayambang	2,400	8,652.80	do.	108,000
Do.	Dagupan	(i)	2,823.02	do.	
Do.	Lingayen	(i)	3,938.99	do.	
Do.	do.	(i)	9,141.22	do.	
Do.	do.[a]	7,000	96,682.22	Pumping	288,000
Do.	Mangaldan	(i)	635.53	Gravity	122,400
Do.	San Fabian	(i)	682.87	do.	57,600
Rizal	Antipolo	2,250	23,299.07	Pumping	82,080
Do.	Pasig	10,000	40,000.00	do.	86,400
Romblon	Looc	2,000	27,517.26	Gravity	144,000
Do.	Romblon	2,300	No record	do.	
Samar	Calbayog	(i)	do.	Rain tank	20,000 Gallon tank.
Do.	Catbalogan	2,000	64,308.94	Gravity	55,000
Do.	Oras	4,000	No record	do.	
Sorsogon	Bacon	3,200	21,000.00		79,200
Do.	Magallanes	3,500	8,000.00	Pumping and gravity.	
Do.	Sorsogon[a]	6,000	70,701.49	Gravity	206,000
Do.	Sorsogon	250	1,044.67	Pumping	36,000
Sulu	Jolo	722	76,974.29	do.	115,200
Surigao	Barrio Bacuag, Gigaquit.	2,405	7,500.00	Gravity	
Do.	Lianga	1,290	1,924.58	do.	2,880
Do.	Placer	870	13,133.95	do.	18,720
Tarlac	Moncada[a]	3,000	22,122.26	do.	86,400
Tayabas	Lucban	3,200	50,205.60	do.	316,800
Do.	Lucena	7,500	234,390.57	do.	432,000
Do.	Mauban	3,500	57,209.32	Pumping	144,000
Do.	Pagbilao[a]	2,300	70,538.47	Gravity	46,000
Do.	Sariaya	6,000	37,935.00	do.	201,600
Do.	Tayabas	4,600	125,159.36	do.	432,000
Zambales	Subic	1,628	10,670.62	do.	11,520
Zamboanga	Zamboanga	5,000	305,361.30	Gravity and hydro-electric.	504,000
Total		414,671	5,033,348.82		

[a] Project completed in 1925. [h] Part of Maria. [i] Market.

TABLE J.—*Waterworks projects under consideration*

Province	Municipality	Estimated cost	Population to be served	System
Albay	Camalig	₱12,000.00	2,500	Gravity.
Do.	Jovellar	14,000.00	2,500	Do.
Do.	Tabaco	45,000.00	5,500	Do.
Antique	Culasi[a]	30,000.00	1,700	Do.
Do.	San Jose Extension	40,000.00	1,500	Pumping.
Do.	Sibalom[a]	27,000.00	2,500	Gravity.
Bataan	Sisiman[a]	13,000.00		Do.
Batanes	Itbaya	15,000.00	1,000	Do.
Do.	Ivana	40,000.00	2,000	Do.
Do.	Sabtang		748	No data.
Batangas	Balayan Extension	1,500.00		Gravity from Balayan.
Bohol	Anda	22,000.00	2,500	Gravity.
Do.	Carmen	6,100.00	600	Do.
Do.	Corella	6,000.00	1,019	Do.
Bohol	Dimiao	₱12,000.00	1,500	Gravity.
Do.	Garcia Hernandez	31,500.00	2,000	Do.
Do.	Laoay Extension	3,200.00	500	Do.
Do.	Tagbilaran improvement.	31,000.00		Pumping.
Do.	Valencia	20,000.00	1,485	Gravity.
Bukidnon	Impasugong	36,000.00	1,600	Do.
Bulacan	Pulilan	18,000.00	3,000	Do.
Do.	San Ildefonso	45,000.00	2,500	Pumping.
Do.	San Miguel	90,000.00	2,308	Do.
Cagayan	Aparri	346,000.00	2,348	Do.
Do.	Camalaniogan		1,382	Do.
Do.	Lal-lo			
Do.	Tuguegarao	201,000.00	12,000	Do.
Camarines Sur	Camaligan	300,000.00	14,000	Gravity.
Do.	Canaman			
Do.				
Do.	Magarao			
Do.	Naga			
Capiz	Panay	3,000.00		Rain rank.
Cebu	Alegria	19,000.00	1,000	Gravity.
Do.	Asturias	27,000.00	1,086	Pumping.
Do.	Argao	50,000.00	4,500	Gravity.
Do.	Badian	30,000.00	1,700	Do.
Do.	Balamban	40,000.00	4,818	Do.
Do.	Barili Extension	8,600.00	300	Do.
Do.	Dumanjug Extension.	22,000.00	3,210	Gravity instead of pumping.
Do.	Mandaue	35,000.00	2,500	Gravity Cebu Extension.
Do.	Moalboal Extension.	25,200.00	3,000	Do. Gravity.
Do.	Oslob	15,000.00	2,000	Do.
Do.	Ronda	28,000.00	1,880	Do.
Do.	San Fernando	21,000.00	3,050	Do.
Do.	San Francisco improvement.	27,000.00		Do.
Do.	Sogod	15,000.00	2,200	Do.
Do.	Talisay	30,000.00	2,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Hydraulic ram and gravity
Ilocos Norte	Badoca[a]	37,000.00	2,800	Pumping.
Do.	Laoag Metropolitan	880,000.00	25,000	Gravity.
Ilocos Sur	Bantay	9,000.00	2,500	Gravity.
Do.	Caoayan	13,500.00	1,700	Do.
Do.	Santa Lucia		1,908	No data.
Do.	Santa	24,000.00	875	Gravity.
Iloilo	Iloilo Metropolitan	2,100,000.00	91,500	Do.
Do.	Pototan-Dingle	279,000.00	9,200	Do.
Do.	San Dionisio[a]	15,000.00	1,500	Do.
Isabela	Ilagan		2,539	No data.
Laguna	Pila	60,000.00	2,171	Pumping.
Lanao	Dansalan		2,000	Hydro-electric.
La Union	Rosario	13,500.00	1,050	Gravity.
Leyte	Burawen		3,038	No data.
Do.	Liloan	10,000.00	700	Gravity.
Do.	Maasin	15,000.00	3,300	Do.
Do.	Tacloban		6,532	No data.
Masbate	San Fernando[a]	21,000.00	2,500	Gravity.
Mindoro	Bulalacao	5,000.00	700	Do.
Do.	Looc		1,623	No data.
Do.	Caluya		1,477	Do.
Misamis	Jasaan, Balingasag[a]	20,000.00	2,500	Gravity.
Do.	Misamis	66,000.00	3,450	Pumping.
Occidental Negros	Bacolod[a]	160,000.00	8,000	Gravity.
Oriental Negros	Guihulngan	21,000.00	3,500	Do.
Do.	Manjuyod	12,000.00	2,000	Do.
Do.	San Juan Siquijor	21,000.00	2,000	Do.
Do.	Vallehermoso	21,000.00	2,500	Do.
Palawan	Cagayancillo		1,066	Rain water tank.
Do.	Concepcion	3,600.00	600	Gravity.
Do.	Coron Improvement	19,000.00		Do.
Pampanga	Angeles[a]	80,000.00	8,000	Pumping.
Pangasinan	Dagupan		4,436	No data.
Do.	Malasioui	30,000.00	2,613	Pumping.
Rizal	Pasig Extension	27,000.00	5,200	Do.
Romblon	Despujol			No data.
Do.	Odiongan			Do.
Samar	Calbayog		5,907	Do.
Do.	Llorente	14,000.00	2,500	Pumping.
Do.	Oras Improvement	10,000.00		Gravity.
Sorsogon	Barcelona	25,500.00	4,000	Do.
Do.	Gubat	78,000.00	7,000	Do.
Surigao	Surigao	70,000.00	6,400	Do.
Tarlac	Tarlac	120,000.00	6,000	Pumping data incomplete.
Tayabas	Atimonan	117,000.00	6,000	Gravity.
Do.	Sampaloc	25,000.00	3,000	Do.
Do.	San Narciso	18,000.00	1,000	Do.
Total		6,313,200.00	364,614	

[a] Projects for which design and estimate were made in 1925.

APPENDIX

ACTIVE PROJECTS, JANUARY 1, 1926

Provinces	Roads and trails			Bridges and culverts			Provincial capitols			Presidencias		Prisons			Schools		Markets and tiendas		Hospitals			Miscellaneous buildings			Water systems			Artesian wells			Port works			Miscellaneous projects							
	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Wireless stations	Surveys and investigations	Irrigation systems	River control	Provincial or municipal boundaries	Monuments	Unclassified	Total
Abra	2	1												1	2								1																		7
Agusan	4	3																													1		1		1		1			1	12
Albay	8																																								8
Antique	3	2								1	2				1										1																10
Bataan	2	3						1							3																				1			1			11
Batangas	8						1			1					1	1		1							2																15
Benguet			1																																						1
Bohol	6	4								3							1					3		1	4								2							2	26
Bukidnon	1	2		1																															1						5
Bulacan	7	1	1	6	1										4									1	3															5	29
Cagayan	2	2		1												1									1						2	2			1					1	13
Camarines Norte	1	4		1					1						1										1			2	3						2					1	17
Camarines Sur	4	5						1								1	1			1															1					1	15
Capiz	3		1	1											5																	2			1		1				14
Cavite	14	5		1				1							1										1	1									1					2	27
Cebu	3	2					1			2					1	1							1	2	1		1					1		1						1	18
Cotabato	1	1																														1								2	5
Davao	5	4		1			1			2						1		1	1			1			1						2	3		7	3					4	37
Ilocos Norte	8			1			1				1				5	4		1	1			1		1																1	25
Ilocos Sur	2									1					3		2								1				1							1					11
Iloilo	8	1	1								1				1		1							1		1						2								4	21
Isabela	4				1		1	1							4																				1					1	13
Laguna	6	2													2		1					1			6																18
Lanao	2									1					1		3												1					1		1					10
La Union	2	4	1					1			2				4							2		1	1										1						19
Leyte	6	4	1				1			1					1						1				1										1					2	19
Manila																						6		39																49	94
Marinduque	3	2																	1						1						1						1				9
Masbate	4	2															1																		4						11
Mindoro	2	4						1							2	1				1		1										1								1	14
Misamis	1	4	2	1	1					1	1			1	2	2					1			1	2							1								3	24
Mountain Province	1	8																			1			1	2															1	14
Nueva Ecija	11	4	1		1						1				3	2							1		2										4			1		2	33
Nueva Vizcaya	7	7					1										1		1			1	1												2	1				1	23
Occidental Negros	7	1		4												1	2				1	2			1															2	21
Oriental Negros	6	2													1										1						1	1								2	14
Palawan	5	4					1	1							3							1		1	2							1		3						3	25
Pampanga	2			2						1					2		1									1		9							1	4					23
Pangasinan	8			1						1					2	1	1					1														3				4	22
Rizal	6			2						1					1	6	1																		1				1	2	21
Romblon	1											1			3	1						1													1						8
Samar	5	1													1																	1			1		1	1		2	13
Sorsogon	4	2	1	1			1	1		1		1			1	1	1																		2						17
Sulu	7	6														1							3									1		1	1						20
Surigao	2	1																				1										4								2	10
Tarlac	3																								1											1				1	6
Tayabas	7	4						1		2															3										1	1		1		3	23
Zambales	5														1	1	1								1					1											10
Zamboanga	3	4						2											2		1	1		2	2						1	1		3	1			1		2	26
Total	212	106	10	24	4	0	9	11	1	19	8	2	0	3	67	21	17	3	6	2	5	23	7	51	42	3	1	11	5	1	8	19	3	16	34	12	4	5	1	111	887

Note.—Under the heading "Unclassified" are included projects not embraced by any of the above classifications. Of the 111 projects under this caption, there are 15 parks, grounds and athletic fields, 7 telephone lines, 3 water tanks, 1 dam, etc.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1926]

A. D. WILLIAMS, *Director of Public Works*
MARCIAL KASILAG, *Chief Constructing Engineer*
E. C. EARLE, *Chief Designing Engineer (on leave)*
W. J. GRODSKE, *Acting Chief Designing Engineer*
A. D. WILLIAMS, *Chief Irrigation Engineer*
TOMAS MAPUA, *Supervising Architect*
JUAN ARELLANO, *Supervising Architect*

CENTRAL OFFICE ORGANIZATION

ADMINISTRATIVE DIVISION

Rosendo Reinoso, Chief, Administrative Division and Chief Accountant (Pensionado in U. S.)
Ramon Roque, Acting Chief Accountant.
Francisco Cruz, Chief Clerk.
T. Camu, Cashier and Disbursing Officer.
Primo Villar, Law Clerk.
Filomeno Sta. Ana, Record Clerk.
Jose de Jesus, Property Clerk.
Salustiano Reyes, Superintendent of Automobiles.

DESIGNING DIVISION

W. J. Grodske, Project Engineer.
L. L. Vincent, E. and M. E.
L. H. Thompson, E. and M. E.
J. C. Cookingham, C. E.
R. S. Clemons, E. and M. E.
Lope Gonzaga, Chief Electrician.
J. Piedad, C. E.
D. Guanio, C. E.
E. Segui, C. E.
A. Villanueva, C. E.
V. Gloria, C. E.
V. Villanueva, Asst. Electrical Engineer.
Pablo Ilagan, Asst. Electrical Engineer.
Ciriaco Coronel, E. and M. E.
Manuel Felizardo, Asst. M. E.
W. Berry, Pile Driver Superintendent.

DIVISION OF ARCHITECTURE

Cheri Mandelbaum, Architect.
Antonio Toledo, Architect.
Antonio Tayzon, C. E.
V. Fernandez Lavadia, C. E.

DIVISION OF ARCHITECTURE—Cont.

Gonzalo T. Vales, C. E.
Teodato P. Macabulos, C. E.
S. B. de Leon, Asst. C. E.
Frank F. Reynolds, Asst. C. E.
Juan Altiveros, Architect.

CONSTRUCTING DIVISION

Melecio Arranz, Div, E., First Division.
E. D. Smith, Div. E., Second Division.
Luis Francisco, Div. E., Third Division.
Vicente Fragante, Div. E., Fourth Division.
(Vacant) Div. E., Fifth Division.
Juan Macaraeg, Div. E., Sixth Division.
Mamerto Cruz, Highway Engineer.
A. T. Sylvester, Constructing Engineer.
V. L. Legarda, C. E., Superintendent, Maintenance, Alteration and Repair.
H. C. Garretson, C. E.
H. B. Lilley, C. E.
Jose Wright, Asst. C. E.
Rafael Contreras, Asst. C. E.
Vicente Purugganan, Asst. C. E.
H. Franco, Chief Electrician.
V. Castillo, Superintendent of Dredges.
R. Custodio, Superintendent of Construction.
F. W. McCaw, Superintendent of Artesian Wells.

IRRIGATION DIVISION

Emilio Quisumbing, Designing Engineer.
Nicanor Cortes, Designing Engineer.
Hilario Clemente, Designing Engineer.
W. J. Lamon, Project Engineer.
Leon Ines, Project Engineer.
H. O. Bauman, Project Engineer.

IRRIGATION DIVISION—Cont.

Ricardo Nostratis, Project Engineer.
Gonzalo Garcia, Project Engineer.
Angel Martinez, Project Engineer.
Gaudioso Cruel, Acting Project Engineer.
Gregorio de Leon, Acting Project Engineer.
Graciano Militante, Acting Project Engineer
Manuel Gonzalez, C. E.
Deogracias de la Paz, C. E.
Julian Buendia, C. E.
Miguel Garcia, C. E.
Faustino Salvador, Asst. C. E.
Agapito Alano, Asst. C. E.
Crisostomo Almajose, Asst. C. E.
Procopio F. Eleazar, Asst. C. E.
Fernando Arnaldo, Asst. C. E.
Ramon C. Caluya, Jr. C. E.
Vicente R. Cruz, Asst. C. E.
Eleuterio Macabalag, Asst. C. E.
Alfredo Eugenio, Asst. C. E.
Roberto P. Villatuya, Asst C. E.
Jose Lahoz, Jr. C. E.
Felipe R. Jimenez, Jr. C. E.
Bartolome Puzon, Jr. C. E.
Nicolas R. Jimenez, Jr. C. E.
Jacinto Gochoco, Chief Hydrographer.
W. Demers, Supervising Hydrographer.
Arturo Pancho, Hydrographer.
Antonio Baldonado, District Hydrographer.
Manuel Trani. Asst. Hydrographer.
Francisco Aquino, Asst. Hydrographer.
P. del Castillo, Jr. Hydrographer.
Artemio Abaya, Chief Water Rights Inspector.
Antonio Villanueva, Asst. Chief Water Rights Inspector.
Mariano N. Leones, Supervising Surveyor.
John P. Utinsky, Overseer.

DISTRICT ORGANIZATION

E. J. Halsema, D. E., Baguio, Benguet.
Melecio Arranz, Div. E., Manila.
Rosalio Villalon, Acting D. E., Ilocos Norte.
Homobono H. Gonzales, C. E., Ilocos Norte.
Eduardo delos Santos, Asst. C. E. Ilocos Norte.
Arturo P. Nitorreda, D. E., Ilocos Sur-Abra.
Carlos Cuevas, Asst. C. E., Ilocos Sur-Abra.
Eulogio Benito, Jr. C. E., Ilocos Sur-Abra.
Irineo M. Santos, D. E., La Union.
Deogracias L. Pablo, Asst. C. E., La Union.
Roque Peredo, Acting D. E., Mountain Province.
Hermenegildo Carpio, Asst. C. E., Mountain Province.
Manuel Diaz, Acting D. E., Cagayan.
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Zacarias Sadueste, Asst. C. E., Cagayan.
Pio Mendoza, Asst. C. E., Cagayan.
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Martin Pulido, Asst. C. E., Nueva Vizcaya.
Jaime Laguardia, Acting D. E., Isabela.
Hilario D. Pulido, Asst. C. E., Isabela.
Mariano D. Rico, Asst. C. E., Isabela.
E. D. Smith, Div. E., Manila.
Francisco Alvarez, Acting D. E., Rizal.
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Segundo Gloria, Asst. C. E., Rizal.
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Clarke A. Babcock, Acting D. E., Cavite.
Rafael Ungson, Asst. C. E., Cavite.
Fernando E. V. Sison, Acting D. E., Bataan.
Nicolas L. Cuenca, D. E., Zambales.
Lorenzo J. Samonte, Asst. C. E., Zambales.
Rufino Pimentel, Asst. C. E., Zambales.
Severino Fernandez, D. E., Bulacan.
Juan G. Paraiso, Asst. C. E., Bulacan.
Dominador M. Cruz, Asst. C. E., Bulacan
Mariano A. de Castro, Acting D. E., Pampanga.
Simeon Alfonso, Asst. C. E., Pampanga.
Vicente Orosa, Acting D. E., Nueva Ecija.
Pedro C. Diaz, Asst. C. E., N. Ecija.
Tomas Lorenzo, Asst. C. E., Nueva Ecija.
Abelardo R. Icasiano, Acting D. E., Tarlac.
Gil R. Mallare, Asst. C. E., Tarlac.
Fidel V. Larracas, D. E., Pangasinan.
Marcial T. Lagunzad, Asst. C. E., Pangasinan.
Ramon Borromeo, Asst. C. E., Pangasinan.
Gregorio Matanguihan, Asst. C. E., Pangasinan.
Luis Francisco, Div. E., Manila.
Isaias Fernando, D. E., Batangas.
Aurelio N. Cobangbang,, C. E., Batangas.
Miguel P. Taña, Asst. C. E., Batangas.
Bonifacio Villanueva, Acting D. E., Laguna.
Jose Villaroel, Asst. C. E., Laguna.
Alfonso Ungson, Asst. C. E., Laguna.
Agapito C. Tuason, Asst. M. E., Laguna.
Jose V. Bagtas, D. E., Tayabas.
Antonio A. Fajardo, Asst. C. E., Tayabas.
Fil de Peralta, Jr. C. E., Tayabas.
Gregorio E. Imperial, D. E., Mindoro.
Martin M. Resplandor, Jr. C. E., Mindoro.
Alfredo V. Martinez, Acting D. E., Camarines Norte.
Silvestre Tan Chauco, Acting D. E., Camarines Sur.
Antonio R. Soriano, Asst. C. E., Camarines Sur.
Pedro Lorenzo, Surveyor, Camarines Sur.
Dalmacio Urtula, D. E., Albay.
Roque F. Tabuena, Asst. C. E., Albay.
Bernardino C. Guerrero, Asst. C. E., Albay.
Jose F. Rocha, Asst. C. E., Albay.
Sergio Bayan, Acting D. E., Sorsogon.
Santiago C. Magbuhat, Asst. C. E., Sorsogon.
Vicente Fragante, Div. E., Manila.
Emilio Buenaventura, Acting D. E., Marinduque.
Eladio M. Santos, Asst. C. E., Marinduque.
Pedro Olymplia, Asst. C. E., Marinduque.
Alejo Aquino, D. E., Iloilo.
Luis M. Sirilan, Asst. C. E., Iloilo.
Jose Virtucio, Asst. C. E., Iloilo.
Isabelo Lagniton, D. E., Capiz.
Jose Arquisola, Jr. C. E., Capiz.
Hosipcio I. Fernandez, Acting D. E., Antique.
Filomeno Piczon, Acting D. E., Romblon.
Saturnino Lopez, D. E., Occ. Negros.
Jose Gadionco, Asst. C. E., Occ. Negros.
Angel Pascual, Asst. C. E., Occ. Negros.
(Vacant) ...., Div. E., Manila.
Valeriano Segura, D. E., Cebu.
Rufino Garcia, C. E., Cebu.
Pedro Formilleza, Asst. C. E., Cebu.
Teodoro Mocorro, Asst. C. E., Cebu.
Jose Follosco, Acting D. E., Bohol.
Julio A. Reyes, Asst. C. E., Bohol.
Domingo see, Asst. C. E., Bohol.
Roy N. Allen, Acting D. E., Leyte.
Alfonso Oboza, Asst. C. E., Leyte.
Leandro Espejo, Asst. C. E., Leyte.
Carlos de Leon, Asst. C. E., Leyte.
Pedro M. Lladoc, Asst. C. E., Leyte.
Pastor Avisado, Acting D. E., Samar.
Liborio Urtizberia, Asst. C. E., Samar.
Rodolfo Maslog, Asst. C. E., Samar.
Ciriaco P. Rama, Surveyor, Samar.
Ambrosio Osmeña, Acting D. E., Or. Negros.
Carlos Rodriguez, Asst. C. E., Or. Negros.
Antonio Piñero, Asst. C. E., Or. Negros.
Jose Ignacio, Acting D. E., Masbate.
Juan Macaraeg, Div. E., Manila.
Jose Lozada, Acting D. E., Zamboanga.
Manuel T. Tubungbanua, Asst. C. E., Zamboanga.
Sergio Palencia, Jr. C. E., Zamboanga.
B. T. Saldaña, Acting D. E., Cotabato.
Severino D. Pineda, Asst. C. E., Cotabato.
Gregorio Alcantara, Acting D. E., Davao.
Jose Viacrucis, Asst. C. E., Davao.
Francisco Fabros, Asst. C. E., Davao.
W. J. Hollis, Acting D. E., Sulu.
Alejandro Rivera, Acting D. E., Lanao.
Lorenzo Ortiz, Acting D. E., Misamis-Bukidnon.
Luis Novenario, Asst. C. E., Misamis-Bukidnon.
Dionisio Escobar, Asst. C. E., Misamis-Bukidnon.
Mariano F. Chiyuto, Acting D. E., Surigao-Agusan.
Marcelo Operario, Jr. C. E., Surigao-Agusan.

LEGEND

Div. E. = Division Engineer.
C. E. = Civil Engineer.
D. E. = District Engineer.
Asst. C. E. = Assistant Civil Engineer.
Jr. C. E. = Junior Civil Engineer.
E. & M. E. = Electrical and Mechanical Engineer.

THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS ·

NOV 18 1927

BULLETIN

Vol. 15 JANUARY 1, 1927 No. 1

LEGISLATIVE BUILDING, MANILA

230215

CONVERSION TABLE

One peso (₱) = 50 cents, U. S. currency.

One kilometer (Km.) = 0.62 mile.

One kilogram (kg.) = 2.20 pounds (lbs.).

One centimeter (cm.) = 0.39 inch.

One meter (m.) = 3.28 feet.

One hectare = 2.47 acres.

One cubic meter (cu. m.) = 1.31 cubic yards.

One hectare meter per day = 8.107 acre feet per day.

One liter per second (second liter) = 0.0353 cubic feet per second (cu. sec.) second feet.

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1926

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, P. I., February 15, 1927

SIR: I have the honor to submit herewith the Report of the Bureau of Public Works for the Fiscal Year ending December 31, 1926.

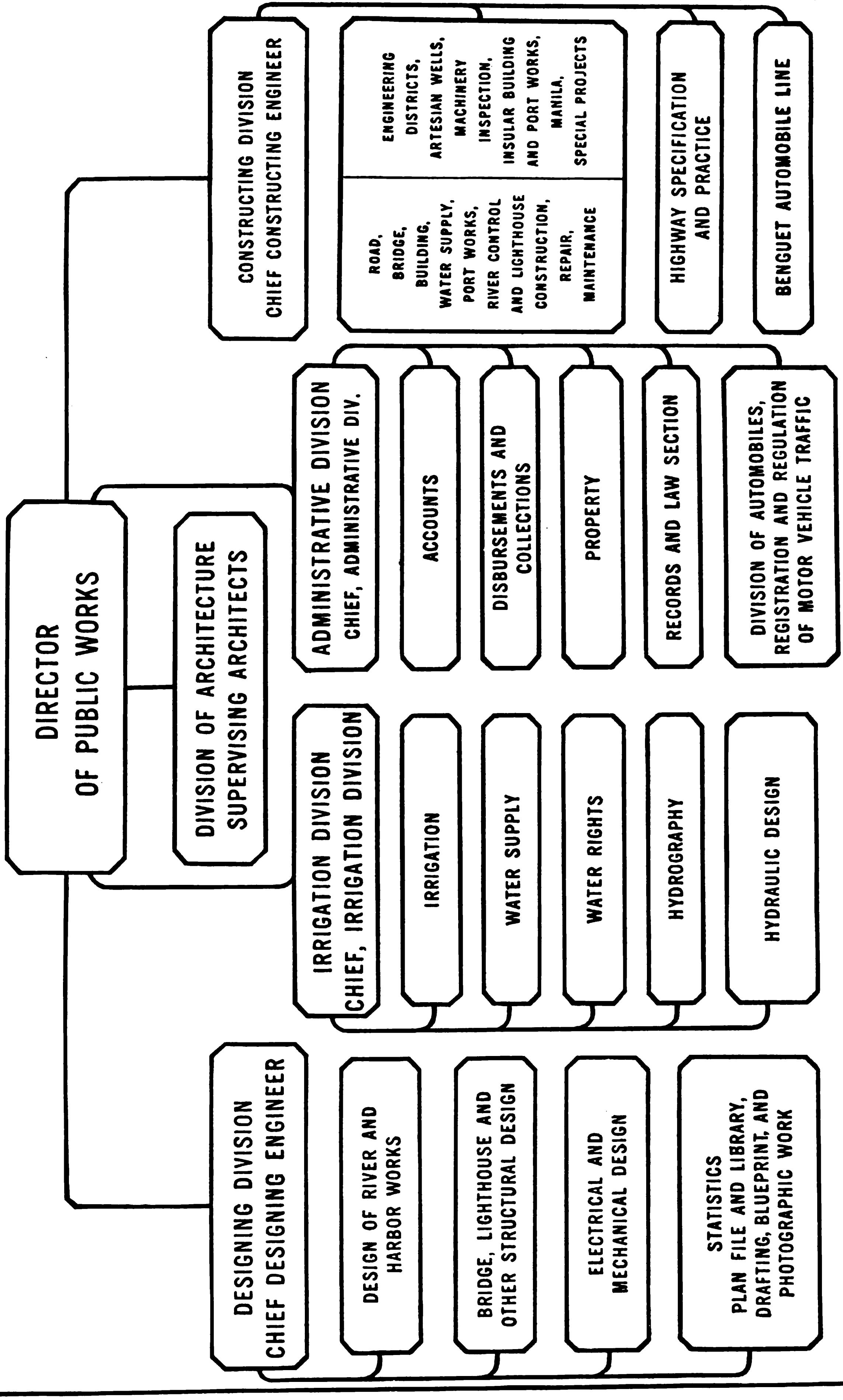
Very respectfully,

A. D. WILLIAMS
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1926


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS PLAN FILE AND LIBRARY, DRAFTING, BLUEPRINT, AND PHOTOGRAPHIC WORK
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
ADMINISTRATIVE DIVISION CHIEF, ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE

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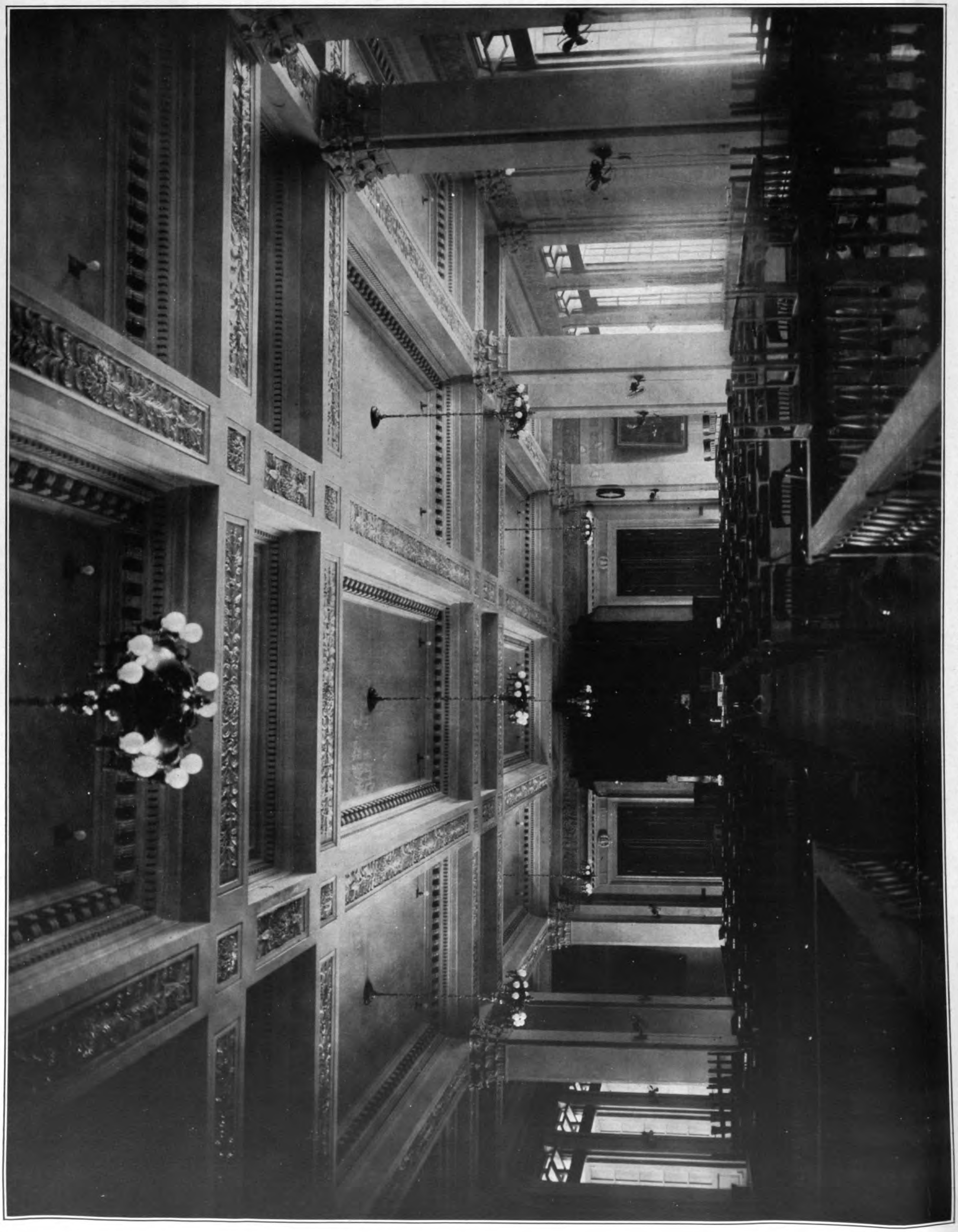


SESSION HALL, HOUSE OF REPRESENTATIVES LEGISLATIVE BUILDING, MANILA

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and principal functions of the Bureau of Public Works are shown in the organization diagram on page four. The Philippine Islands are now divided into forty-seven (47) engineering districts which, with the exception of a separate district for the City of Manila, are coextensive with provincial limits. The district engineer is the local representative of the Bureau in each district and is responsible for all activities, excepting the larger irrigation projects which are constructed by project engineers under the direct supervision of the Manila Office. The Central Office in Manila prepares plans and specifications for construction projects and exercises general supervision over all activities of the Bureau.

PERSONNEL

Number of employees paid direct from Bureau and Project Funds as of December 31, 1926: Americans, 19; Filipinos, 362.

(NOTE.—The corresponding figures for December 31, 1925, are 19 and 357 respectively.)

Number of technical employees as of December 31, 1926: Americans, 14; Filipinos, 189.

(NOTE.—The corresponding figures for December 31, 1925, are 16 and 174 respectively.)

American technical employees

Position	Permanent	Temporary	Total
Civil engineer	8	1	9
Assistant engineer	1	0	1
Electrical and mechanical engineer	2	0	2
Surveyor	1	0	1
Architect	1	0	1
Total	13	1	14

Filipino technical employees

Position	Permanent	Temporary	Total
Civil engineer	51	15	66
Assistant civil engineer	79	20	99
Junior civil engineer	2	2	4
Mechanical engineer	2	0	2
Mechanical and electrical engineer	2	0	2
Assistant mechanical engineer	1	0	1
Assistant electrical engineer	2	0	2
Junior electrical engineer	0	1	1
Surveyor	5	0	5
Junior surveyor	2	0	2
Supervising architect	2	0	2
Agricultural inspector	1	0	1
Total	149	38	187

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau by whatever branch of the Government paid:

Changes	American	Filipino	Total 1926	Total 1925
Number of appointments	0	217	217	241
Number of transfer to Bureau	0	9	9	5
Number of separation for cause	0	6	6	14
Number of voluntary resignations	2	109	111	143
Number of transfers from Bureau	0	5	5	4
Number of retirements	3	4	7	3
Number of separations due to expiration of employment	0	5	5	6
Number of deaths	0	5	5	4

NOTE.—Item "Number of appointments" includes new and probational appointments.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1925 AND 1926

Items	Insular expenditures				Provincial and municipal expenditures		Funds from private sources		Total	
	Bureau of Public Works		Appropriation controlled by other Bureaus							
	1925	1926	1925	1926	1925	1926	1925	1926	1925	1926
Roads and bridges	₱204,558.90	₱126,857.80	₱32,866.86	₱15,431.88	₱8,730,473.43	₱9,078,239.43			₱8,967,899.19	₱9,220,529.11
Telegraph, telephone, and cable lines	258,773.62	438,830.48		2,616.00	80,049.63	23,444.73			438,823.25	464,891.21
Buildings	139,957.41	441,261.03	946,000.29	1,062,969.66	1,856,449.38	2,904,836.78			2,942,407.08	4,409,067.47
Wireless station buildings including towers, and masts	1,069.03	48,142.72	325.80	210.20					1,394.83	48,352.92
Maintenance, alteration, and repairs of public buildings	434,678.21	351,373.77	4,411.39	5,811.31	197,702.17	208,186.29	₱5,383.23	₱2,233.20	642,175.00	567,604.57
River and harbor works (including lighthouses, buoys and beacons)	1,683,919.51	1,653,831.17	1,385,152.75	1,322,957.79	38,405.57	73,620.70	3,137.33	13,562.09	3,110,615.16	3,063,971.75
Artesian wells and water supply	168,936.73	254,291.31	13,501.36	17,944.11	1,111,959.76	634,153.81	4,422.36	17,242.67	1,298,820.21	923,631.90
Irrigation projects	207,594.67	169,411.02	2,497,775.19	2,246,970.69	2,858.87	572.76	32,383.30	136,768.15	2,740,612.03	2,553,722.620
Benguet automobile line	90,000.00	85,000.00							90,000.00	85,000.00
Registration and regulation of motor vehicle traffic	[a]63,425.50	62,555.35							63,425.50	62,555.35
Los Baños quarry	110,000.00	110,000.00							110,000.00	110,000.00
Operation and maintenance of central garage	19,030.59								19,030.59	
Board of examiners for engineers and architects	2,000.00	2,000.00							2,000.00	2,000.00
Regulation, safeguarding of traffic and collection of tolls on Kennon and Naguilian Roads	9,000.00	9,000.00							9,000.00	9,000.00
Miscellaneous			172,480.44	163,349.52	242,161.31	255,616.12	4,024.51	2,696.40	418,666.26	421,662,04
Total	3,492,944.17	3,752,554.65	5,052,514.08	4,838,261.16	12,260,060.12	13,178,670.62	49,350,73	172,502.51	20,854,869.10	21,941,988.94

[a] NOTE.—₱13,425.50 represents the amount paid for salaries provided in the General Appropriation Act 3217 for the year 1925.

BALANCE SHEET, BUREAU OF PUBLIC WORKS

Assets	1925	1926
CURRENT:		
Cash, collecting and disbursing officer	₱1,605,498.15	₱1,632,830.50
Cash (deposit), Insular Treasury	(2,998,560.00)	1,099,935.22
Accounts receivable	4,331,808.90	2,603,068.89
Supplies and materials	714,219.80	687,026.43
Prepayments	623.71	12,392.95
INVESTMENT:		
Loan to municipality of Antipolo	8,000.00	4,000.00
Total current assets	3,661,590.56	6,039,253.99
FIXED PROPERTY:		
Real property and improvements	43,693,073.93	45,178,646.33
Equipment	3,545,182.57	4,529,403.76
(Less depreciation)	(763,448.85)	(671,462.43)
Total assets	50,136,398.21	55,075,841.65

Liabilities	1925	1926
CURRENT:		
Accounts payable	₱1,916,837.40	₱1,658,974.83
Accrued leave payable	198,927.50	208,300.75
Undistributed collections	19,900.67	10,960.40
Deferred credits to income	5,532.78	5,421.23
Fiduciary fund	6,157.97	19,224.41
Insurance reserve	29,699.76	28,052.55
BALANCES OF APPROPRIATIONS:		
Dwellings and equipment for rent, Baguio		40,984.17
Motor vehicle special fund, Act 3045	112,735.59	43,731.52
Benguet auto line		123,148.74
Construction of buildings, etc	101,799.35	528,348.32
Maintenance, alteration, and repair of public buildings	142,325.13	158,151.36
Irrigation systems	41,566.91	21,655.89
Artesian wells and waterworks	57,694.33	14,403.03
Harbor and river improvement	596,032.60	844,183.00
Highway special fund (revenue from gasoline and lubricating oil)		1,709,145.80
Roads and bridges	28,284.45	19,426.65
Telephone, telegraph, cable, etc	391,832.35	354,859.15
Lighthouse, buoys, and beacons	12,263.77	250,282.20
Total current liabilities	3,661,590.56	6,039,253.99
PRINCIPAL ACCOUNT SURPLUS:		
Fixed property investment	46,474,807.65	49,036,587.66
Total liabilities	50,136,398.21	55,075,841.65

STATEMENT OF APPROPRIATION, INCOME, AND EXPENSES

Debit	1925	1926
Reversion of unexpended balances of administrative appropriation	₱44,571.14	₱13,248.70
Reversion of receipts	910,891.00	989,958.92
Operating expenditures offset by receipts	8,917,881.67	8,501,337.88
Expenditures, administrative appropriation	898,904.86	911,218.27
Outlays, purchase of equipment	5,029.27	4,679.25
Total debit	10,777,277.94	10,420,443.02

Credit	1925	1926
Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱948,505.27	₱929,146.22
Receipts—prime cost	8,917,881.67	8,501,337.88
Receipts—surcharges	806,580.60	857,032.28
Receipts—miscellaneous	56,622.08	56,363.79
Gain on supplies sold	1,563.49	2,065.02
Inventory adjustments	11,093.22	4,135.57
Income from rentals, Equipment	21,029.59	16,315.54
Sales of fixed assets	1,543.98	2,280.34
Prior year's credit	12,458.04	51,776.38
Total credit	10,777,277.94	10,420,443.02

OPERATION STATEMENT, BUREAU OF PUBLIC WORKS

Operating revenue	1925	1926
Rental	₱21,029.59	₱16,315.54
Surcharges	806,580.60	857,032.28
Gain on goods sold	1,563.49	2,065.02
Inventory adjustments	11,093.22	4,135.57
Sales of fixed assets	1,543.98	2,280.34
Other service income	56,622.08	56,353.79
Prior year's credit	12,458.04	51,776.38
Total	910,891.00	989,958.92

Operating expenses	1925	1926
Supervising, technical, and clerical services—(salaries)	₱726,342.91	₱738,388.05
Labor	46,321.95	47,104.00
Consumption of supplies and materials	41,755.91	42,500.00
Rental of buildings	24,000.00	24,000.00
Illumination and power service	7,918.43	8,600.00
Traveling expenses of personnel	26,405.92	23,000.00
Repair service	7,596.18	8,500.00
Postal, telegraph, telephone, and cable service	11,335.46	11,620.00
Other expenses	7,228.10	7,506.22
Total operating expenses	898,904.86	911,218.27
Operating profit	11,986.14	78,740.65
Total	910,891.00	989,958.92

SPECIAL APPROPRIATIONS

Name of activity	Appropriation		Expenditures		Reversion of appropriation		Income	
	Act 3123	Act 3217						
	1925	1926	1925	1926	1925	1926	1925	1926
1. Registration and regulation of motor vehicles	₱50,000.00	₱64,500.00	₱50,000.00	₱62,555.35		₱1,944.65	₱798,438.62	₱985,051.28
2. Regulation and safeguarding of traffic and collection of tolls	9,000.00	9,000.00	9,000.00	9,000.00			29,297.15	45,479.98
3. Benguet auto line	90,000.00	85,000.00	90,000.00	85,000.00			151,424.21	123.148.74
4. Los Baños quarry	110,000 00	110,000.00	110,000.00	110,000.00			67,447.46	66,274.15
5. Board of Examiners for Engineers and Architects	2,000.00	2,000.00	2,000.00	2,000.00			2,860.00	1,910.00
6. Central garage	36,000.00		19,030.00		₱16,969.41		10,922.82	
Totals	297,000.00	270,500.00	280,030.59	268,555.35	16,969.41	1,944 65	1,060,390.26	1,221,864.15

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) TO DECEMBER 1926

Assets	1925	1926
1. Principal account surplus from previous year	₱45,252,225.26	₱46,474,807.65
2. Purchase of equipment	52,776.22	315,786.97
3. Fixed property brought into account	1,198,711.98	1,137,783.84
4. Equipment acquired by transfer	4,875.30	5,656.00
5. Equipment found at station including worn out tires taken into account	840.20	1,149,232.05
6. Equipment acquired by construction	543.77	73.14
Total debits	46,509,972.73	49,083,339.65

Liabilities	1925	1926
1. Equipment sold	₱1,535.10	₱2,278.12
2. Equipment condemned on Insular inventory report, dropped on affidavits, undersold, etc	73,583.14	91,986.42
3. Equipment dropped by transfer to provinces and municipalities	27,450.05	20,752.02
4. Equipment and fixed assets dropped by transfer to other Bureaus	6,179.93	23,721.85
5. Depreciation written off	(73,583.14)	(91,986.42)
6. Principal account surplus, December 31	46,474,807.65	49,036,587.66
	46,509,972.73	49,083,339.65

Km. 556, Cagayan Valley Road, Cagayan Province showing tobacco plantations through which this road passes

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first class	Kilometers	200.6
Reinforced concrete bridges and culverts completed (in this figure, concrete pipe culverts are not included)	Number	28
Successful deep wells completed	do	81
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	Number	61
Insular irrigation systems completed	do	4
Waterworks projects completed (Total population served 57,560)	do	21

Expenditures supervised during the year 1926 as compared with the year 1925

	1925	1926
Total expenditures	[a] ₱20,854,869.10	₱21,941,988.94
Total expended upon road and bridge work	8,967,899.19	9,220,529.11
Total expended upon building work	3,585,976.91	5,025,024.96
Total expended upon port works	3,110,615.16	3,063,971.75
Total expended upon water supply	1,298,820.21	923,631.90
Total expended upon irrigation projects	2,740,612.03	2,553,722.62
Operation of auto line, quarries and the supervision of motor vehicle traffic	291,456.09	266,555.35
Expenditures on miscellaneous items account for the balance	859,489.51	888,553.25

[a] The sum of ₱13,425.50 represents the amount paid for salaries provided in the General Appropriation Act, No. 3217 for the year 1925.

DEFINITIONS FOR ROAD CLASSIFICATION

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

ROAD WORK

Roads in existence in the various provinces of the Philippines as of December 31, 1926

Provinces	First-class road	Second-class road	Third-class road	Total road	Trails
	Kms.	*Kms.*	*Kms.*	*Kms.*	*Kms.*
Abra	64.4	17.0	11.4	92.8	112.6
Agusan	....	25.7	24.5	50.2	45.5
Albay	208.2	24.9	27.9	261.0	112.2
Antique	108.8	116.0	3.5	228.3	13.7
Baguio	47.8	15.6	.3	63.7	....
Bataan	38.6	19.1	2.3	60.0	75.7
Batangas	204.5	34.5	140.0	379.0	44.8
Benguet	72.4	75.9	8.2	156.5	2.8
Bohol	244.0	100.4	28.2	372.6	4.0
Bukidnon	....	103.1	43.3	146.4	70.8
Bulacan	116.3	138.6	63.9	318.8	....
Cagayan	72.8	85.1	65,9	223.8	106.3
Camarines Norte	34.3	6.0	12.1	52.4	32.6
Camarines Sur	161.2	24.8	50.8	236.8	39.1
Capiz	201.2	94.9	14.4	310.5	119.5
Cavite	85.5	29.5	9.5	124.5	107.8
Cebu	334.7	279.7	102.2	716.6	26.0
Cotabato	22.3	1.9	45.8	70.0	336.8
Davao	29.8	10.8	46.5	87.1	576.4
Ilocos Norte	84.9	111.9	12.4	209.2	56.2
Ilocos Sur	181.8	17.1	....	198.9	....
Iloilo	287.1	65.2	126.0	478.3	8.9
Isabela	82.1	41.9	100.7	224.7	....
Laguna	161.4	31.3	45.9	238.6	8.5
Lanao	43.4	21.3	36.3	101.0	275.2
La Union	117.2	37.4	22.8	177.4	9.5
Leyte	140.0	79.4	82.9	302.3	79.8
Marinduque	51.5	25.8	.5	77.8	56.6
Masbate	36.0	15.8	8.2	60.0	....
Mindoro	40.2	33.3	21.5	95.0	273.7
Misamis	122.0	111.7	60.5	294.2	129.4
Mountain Province	....	130.9	190.7	321.6	1,086.0
Nueva Ecija	199.2	46.1	217.3	462.6	....
Nueva Vizcaya	49.8	23.4	58.8	132.0	145.3
Occidental Negros	360.9	65.1	85.9	511.9	55.8
Oriental Negros	173.6	30.5	77.0	281.1	157.5
Palawan	....	2.9	52.0	54.9	82.4
Pampanga	201.1	63.2	93.7	358.0	....
Pangasinan	489.8	51.6	156.0	697.4	....
Rizal	185.5	20.9	27.7	234.1	15.0
Romblon	....	46.5	4.8	51.3	232,9
Samar	108.3	112.9	94.8	316.0	28.0
Sorsogon	118.7	66.0	10.2	194.9	....
Sulu	26.8	23.7	9.1	59.6	137.9
Surigao	54.3	....	22.0	76.3	34.8
Tarlac	160.8	8.5	39.0	208.3	5.0
Tayabas	193.2	26.9	65.2	285.3	....
Zambales	68.2	44.2	28.6	141.0	11.4
Zamboanga	62.1	52.2	29.4	143.7	115.5
Total	5,846.7	2,611.1	2,480.6	10,938.4	4,831.9

Type of surfacing

	December 31, 1925	December 31, 1926
	Kilometers	*Kilometers*
Concrete	....	2.5
Asphalt	....	9.2
Stone	1,632.0	1,660.1
Gravel	3,762.5	3,899.9
Coral	1,741.3	1.920.2
Unsurfaced	3,517.7	3,446.5
Total	10,663.5	10,938.4

BRIDGE

Durable bridges and culverts in existence

Fiscal year ending	All durable structures	
	Total number	Increase during year
June—		
1910	4,372	507
1911	4,842	470
1912	5,177	358
1913	5,654	508
December—		
1913 (6 months)	5,901	190
1914	6,206	305
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	54
1919	7,491	65
1920	7,521	30
1921	7,481	[a] 40
1922	7,562	81
1923	7,586	24
1924	7,613	27
1925	7,779	166
1926	7,753	[a] 26

[a] Decrease.

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The decrease in the number of structures over last year is due to the fact that many structures lost or destroyed in previous years are reported for first time this year. The above figures are obtained from semi-annual reports of district engineers.

Reinforced concrete structures in existence

Fiscal year ending	Total number	Total meters
June—		
1910	[a]	[a]
1911	2,004	7,709
1912	2,350	9,216
1913	2,854	11,224
December—		
1913 (6 months)	3,046	11,984
1914	3,247	13,071
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	16,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280
1922	4,366	17,684
1923	4,400	18,045
1924	4,428	18,413
1925	4,575	18,894
1926	4,597	19,236

[a] No data.

NOTE.—All reinforced concrete structures were built under American Administration, together with a large number of steel and other classes of construction.

ARTESIAN WELLS

An average of nineteen (19) drilliing machines were in active operation until the Insular funds for the drilling of artesian wells were exhausted at the end of September when, all of the machines were laid up except those drilling for private parties and used in repairing old wells whose operations were financed entirely by the parties concerned. The average number of machines used in drilling municipal and provincial wells was 13⅝ as against 19⅜ for the preceding year. This decrease was due to the reduced appropriation for artesian well drilling for the year 1926, which added to the small balance left from the 1925 appropriations, amounted to approximately ₱250,000.

The total number of successful artesian wells drilled by the Bureau of Public Works from 1904 to 1926 is 1,832. This number includes private wells drilled from 1904 to 1923. These wells are capable of supplying a total of 43,309,300 gallons of potable water per 12-hour day which at the rate of 20 gallons per capita would supply no less than 2,665,465 people.

Funds expended

	1926		1925	
	Pesos	Per cent	Pesos	Per cent
Successful wells	143,716.28	83	245,336.22	84
Unsuccessful wells	57,435,90	17	67,124,24	16
Total	201,152.18	100	312,460.46	100

Out of the ₱250,000 available for the year 1926, the amount of ₱201,152.18 was expended for the drilling of artesian wells, the remainder having been expended for the purchase, repair and maintenance of equipment, and in reimbursing municipalities concerned the one-third cost of wells drilled in 1925, and declared unsuccessful in 1926.

Comparative cost of drilling

(a) UNSUCCESSFUL WELLS INCLUDED

	1926	1925	+ Increase — Decrease
Per meter	₱21.24	₱28.10	— ₱6.86
Per foot	6.46	8.57	— 2.11

(b) NOT INCLUDING UNSUCCESSFUL WELLS

Per meter	₱22.30	₱29.12	— ₱6.82
Per foot	6.79	8.88	— 2.06

Summary of deep well drilling, 1926

[Not including private wells]

	Number of wells drilled	Total depth in meters	Total flow in liters per minute
Successful:			
Flowing	30	3,114	5,720
Pumping	51	3,332	3,729
Total successful	81	6,446	9,449
Unsuccessful	17	3,023	....
Grand total	98	9,469	9.449

The Bureau of Public Works drilled two wells for the Insular Government, one at the Philippine General Hospital and another at the Deaf and Blind School at Pasay, Rizal, which was nearly completed at the end of the year.

In 1923 a policy was adopted whereby Government drilling machines could be rented to private parties at a fixed charge of ₱18 per day, such parties assuming all responsibility for the supervision and cost of the drilling operations undertaken. Under this arrangement drilling machines were rented for private drilling operations during 1926, to the North Negros Sugar Company, Occidental Negros, Mr. Miguel Sanson, Lohug, Cebu, and the Pangasinan Transportation Company, Dagupan, Pangasinan.

This policy was, however, discontinued during the latter part of the year and the former practice resumed of drilling wells for private parties, provided the services of a private contractor could not be secured and provided a Government drilling machine was available for the work. This method has been found to be more satisfactory since it enables this Bureau to exercise closer supervision over drilling operations and the use of Government equipment. Authority was granted under this policy, for the drilling of an artesian well for the Army and Navy Young Men's Christian Association on Calle Aduana, Intramuros, Manila.

Percentage of unsuccessful wells drilled (not including private wells)—1926, 17; 1925, 16.

Out of the 17 unsuccessful wells drilled during 1926, one was abandoned due to the loss of a sand pump in the hole, 6 due to the absence of water at considerable depths and the rest were successfully completed, but the water obtainable was either salty or not suitable for drinking or for domestic purposes.

300 gallon flowing artesian well drilled in the Barrio of Seneguelasan municipality of Bacoor, Cavite Province

Drilling machines operated by the Bureau of Public Works

Type of machine	In field	Stored at pipe bodega and property division	Total
Cyclone (belongs to the Province of Bulacan)	1	....	1
Keystone (operated by Los Baños Quarry)	1	....	1
Star	1	3	4
Columbia No. 3	13	1	14
Columbia No. 5	2	4	6
Columbia No. 10	....	4	4
Standard	....	1	1
Total	18	13	31

BUREAU OF PUBLIC WORKS MACHINE SHOP

During the year of 1926, the shop performed a total of 954 work orders amounting to ₱138,270.31, as against 1,036 work orders completed in 1925 valued at ₱102,179.07. This shows a decrease in work orders accomplished in 1926 by 82, but an increase in the income of ₱26,091.24.

The shop personnel performed overtime work equivalent to 122 working days as against 65 working days in 1925.

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year ending December 31, 1926, there were 4,702 motor vehicles newly registered and 18,836 re-registered for operation, or a total of 23,538 motor vehicles, as compared with 19,589 registered during 1925. There were also 1,320 motor vehicles registered for storage. During this same period 11,431 applicants for drivers' licenses were examined and 8,313 new licenses issued. Including renewals, 33,440 operators of motor vehicles were licensed during 1926.

The following is a comparative tabulation of motor vehicles registered during the year 1925 and 1926:

	1925	1926
Automobiles	13,549	16,239
Motor trucks	5,225	6,511
Motorcycles	815	758
Total	19,589	23,538

The campaign for the apprehension of violators of the Motor Vehicle Law was carried out more vigorously with the result that there were 1,972 licenses suspended and 34 licenses revoked as compared with 1,243 licenses suspended and 20 licenses revoked during 1925. The results of the campaign are as follows:

	Total number of cases reported		Cases for reckless driving		Cases for speeding	
	1925	1926				
			Number	*Per cent*	*Number*	*Per cent*
First quarter	545	1,178	267	23	108	9
Second quarter	664	1,124	220	20	102	9
Third quarter	776	959	182	19	88	9
Fourth quarter	718	888	200	22	101	9
Total	2,703	5,149	869	....	399	....

	1925	1926
Number of deaths reported during the year	37	35
Number of licenses suspended during the year	1,243	1,972
Number of licenses revoked during the year	20	84
Amount of fines reported imposed during the year	₱25,801.00	₱13,847.00

Provisions of the Automobile Law (Act 3045) commonly violated

	1925	1926
Section 20, overloading	662	1331
Section 26 (*b*), reckless driving	573	859
Section 26 (*a*), speeding	163	401
Section 14 (*h*), driving without license	256	326
Section 34, lights	180	145

COLLECTIONS AND EXPENDITURES

The following tabulation shows the yearly amount of funds collected and expended for the registration and regulation of motor vehicles from 1912 to 1926:

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,392.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	628,918.54	60,000.00
1924	633,214.36	50,000.00
1925	798,438.62	63,025.50
1926	985,051.28	62,555.55

THE BENGUET AUTOMOBILE LINE

The Benguet Automobile Line operated during the year 1926, 3 first-class busses, 1 third-class buss, 1 combined passenger and express truck, 1 fire truck, 4 express and freight truck, 5 and 12 special touring cars, and handled 6,424 and 278 half rate first-class passengers, 14,935 and 1,795 half rate third-class passengers, 130,323 kilos of hand baggage, 1,568,437 kilos of express and freight, and 286,332 kilos of dead head express and freight. No accidents occurred in connection with the operation of the line.

The appropriation authorized for the Benguet Automobile line was ₱85,000, while the total receipts during the year including 1925 collections made by the Manila Railroad Company in the amount of ₱6,709.17, but not including collections for the months of October, November, and December, 1926, amounted to ₱123,148.74.

Tolls collected on the Kenon Road during the year amounted to ₱45,479.98 as compared with ₱29,297.15 during 1925.

THE KENON AND NAGUILIAN ROADS

These two Insular roads to Baguio were maintained in good condition at a very reasonable cost. On the Kenon Road, three wooden pony truss bridges at Kms. 269.65, 251.70 and 253.20 were replaced with 60-foot steel trusses; while a number of sharp curves were eliminated and roadway widened at dangerous points on the Naguilian Road.

A comparative statement of traffic over these roads for the years 1924, 1925 and 1926 is given hereunder:

Summary of traffic over the Kenon and Naguilian roads

KENON ROAD

Year	Pedestrains	Bullcarts	Animals led or ridden	Calesas	Motorcycles	Autos (passenger)	Autos (trucks)	Wagons
1924	12,173	2,924	198	....	1,150	6,137	4,398	48
1925	10,743	1,176	159	1	543	7,080	4,439	58
1926	10,004	1,635	....	....	441	8,253	4,655	70

NAGUILIAN ROAD

Year	Pedestrains	Bullcarts	Animals led or ridden	Calesas	Motorcycles	Autos (passenger)	Autos (trucks)	Wagons
1924	23,136	8,538	676	13	112	4,455	8,436	315
1925	19,893	2,173	516	....	190	9,032	4,164	2,084
1926	26,808	3,062	1,878	6	84	9,734	4,405	2,448

End of Concrete Section, Iloilo-Jaro Road, Iloilo Province

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Chief Constructing Division*

ROADS

As has been the case for the past six years, it was necessary during 1926 to use the larger part of the available road and bridge funds for the maintenance of existing roads, which resulted in a comparatively small increase in the kilometerage of improved roads. During the coming year, however, funds amounting to ₱1,700,000 will be available from Act 3248 (Gasoline and Oil Tax Law), which, together with the increased insular appropriations of ₱3,300,000, will permit a more active construction program. The following tables Nos. 1-A and 1-B show the source and amounts of funds available for road purposes during past years and also the relative amounts expended for maintenance and construction:

TABLE 1-A.—*Funds for road construction and maintenanse*

Year	General taxation (provincial road and bridge funds)	(Act 3045) automobile registration and license fees	Insular appropriation	Total
1922	₱4,469,555.00	₱518,825.85	₱3,245,000.00	₱8,233,380.85
1923	3,999,756.00	628,918.54	2,380,000.00	7,008,674.54
1924	4,326,878.00	633,214.36	2,400,000.00	7,360,092.36
1925	4,406,320.00	798,438.62	2,517,327.00	7,722,085.62
1926	5,871,384.99	985,051.28	2,705,000.00	9,561,436.27

TABLE 1-B.—*Amounts expended for road construction and maintenance*

Year	Maintenance	Construction	Total
1922	₱5,050,554.19	₱2,197,565.64	₱7,248,119.83
1923	5,356,230.19	2,007,147.73	7,363,377.92
1924	5,693,466.40	2,619,316.68	8,312,783.08
1925	5,873,078.83	3,545,890.66	9,418,969.29
1926	5,806,013.33	3,689,750.14	9,495,763.47

It will be noted from the above tables that there has been no appreciable increase in available funds for a number of years while the cost of maintenance has risen considerably. This is largely due to the increasing use of motor vehicles, which in many localities has reached a stage where the construction of hard surface pavements will be a good investment. On sections of the Manila North and South roads and also on sections of other roads subjected to very heavy traffic the cost of maintaining the existing water-bound macadam roads now exceeds three thousand pesos per kilometer per annum which would fully justify the cost of hard surface pavements. While it has been possible to construct short experimental sections of such pavements, the solution of this problem seems to lie in adopting a definite program of reconstruction to be financed in the case of most provinces by bond issues. The following tables show the cost of road maintenance by provinces during 1926 and the average for all provinces during the past five years:

TABLE 1-C.—*Costs of maintenance of first, second, and third-class roads*

	First-class roads			Second and third-class roads		
	Length of first-class roads	Total expenditures for maintenance of first-class roads	Average cost per kilometer of maintenance	Length of second and third-class roads	Total expenditures for maintenance of second and third-class roads	Average cost per kilometer of maintenance
	Kms.			*Kms.*		
Abra	64.4	₱34,613.51	₱537.48	28.4	₱2,107.62	₱74.21
Agusan	(a)	....	....	50.2	20,018.70	398.67
Albay	208.2	123,701.83	594.15	52.8	9,568.41	181.22
Antique	108.8	55,222.41	507.56	119.5	31,635.83	264.74
Bataan	38.6	24,064.01	623.42	21.4	3,347.83	156.45
Batangas	204.5	123,810.28	605.43	174.5	18,390.98	105.80
City of Baguio	47.8	82,873.03	1,733.75	15.9	4,836.10	304.16
Benguet	72.4	123,932.50	1,711.77	84.1	11,937.72	142.94
Bohol	244.0	132,370.56	542.50	128.6	42,424.60	329.90
Bukidnon	(a)	....	....	146.4	39,904.10	272.57
Bulacan	116.3	104,676.29	900.05	202.5	71,941.01	355.26
Cagayan	72.8	34,228.28	470.01	151.0	9,399.64	62.25
Camarines Norte	34.3	22,854.94	666.30	18.1	4,327.32	239.07
Camarines Sur	161.2	119,669.69	742.00	75.6	18,588.01	245.87
Capiz	201.2	134,976.62	670.86	109.3	25,262.57	231.18
Cavite	85.5	98,539.32	1,152.46	39.0	25,859.09	663.05
Cebu	334.7	260,340.25	777.83	381.9	77,313.03	202.44
Cotabato	22.3	21,850.41	979.08	47.7	13,647.26	286.10
Davao	29.8	67,988.17	2,281.48	57.3	19,751.31	344.70
Ilocos Norte	84.9	77,018.79	907.17	124.3	49,192.45	395.77
Ilocos Sur	181.8	121,037.77	665.77	17.1	2,034.49	118.98
Iloilo	287.1	233,686.97	813.96	191.2	9,949.62	52.04
Isabela	82.1	43,046.62	524.32	142.6	3,140.49	22.02
Laguna	161.4	150,651.19	933.40	77.2	15,542.89	201.33
Lanao	43.4	47,297.80	1,089.81	57.6	12,831.17	223.76
La Union	117.2	59,859.31	510.74	60.2	12,918.44	214.59
Leyte	140.0	225,551.97	1,611.08	162.3	49,426.27	304.54
Marinduque	51.5	28,754.02	558.33	26.3	2,686.80	102.17
Masbate	36.0	14,737.46	409.37	24.0	183.42	7.64
Mindoro	40.2	14,832.36	368.96	54.8	19,535.12	357.48
Misamis	122.0	109,184.88	894.96	172.2	46,017.31	267.23
Mountain Province	(a)	(a)	....	321.6	62,342.54	193.85
Nueva Ecija	199.2	190,835.46	958.01	263.4	15,223.05	57.79
Nueva Vizcaya	49.8	42,828.79	860.01	82.2	5,704.11	69.40
Occidental Negros	360.9	261,098.38	723.46	151.0	19,562.24	129.55
Oriental Negros	173.6	118,428.62	682.19	107.5	14,672.90	136.49
Palawan	(a)	(a)	....	54.9	7,644.51	139.24
Pampanga	201.1	176,657.61	878.45	156.9	16,320.82	104.02
Pangasinan	489.8	352,698.87	720.09	207.6	10,769.02	51.87
Rizal	185.5	221,340.52	1,193.21	48.6	8,898.89	183.10
Romblon	(a)	(a)	....	51.3	15,828.96	308.55
Samar	108.3	81,313.44	750.82	207.7	70,923.72	341.50
Sorsogon	118.7	66,709.42	562.00	76.2	15,252.79	200.16
Sulu	26.8	28,224.11	1,053.14	32.8	13,513.49	413.00
Surigao	54.3	43,345.36	798.05	22.0	5,458.87	248.13
Tarlac	160.8	89,207.15	554.77	....	....	....
Tayabas	193.2	185,037.82	957.75	92.1	11,957.20	129.80
Zambales	68.2	31,983.32	468.96	72.8	9,359.64	128.50
Zamboanga	62.1	57,293.01	922.59	81.6	54,641.23	669.62
Total	5,846.7	4,638,373.12	793.33	5,044.2	1,031,788.58	204.55

[a] None.

TABLE 1-D.—*Average cost maintenance of first, second, and third-class roads*

	First-class road			Second and third- class road		
Year	Total length in kilometers maintained thruout the year	Total cost of maintenance	Average cost per kilometer maintained	Total lengtn in kilometers maintained thruout the year	Total cost of maintenance	Average cost per kilometer maintained
1922	4,854.5	₱4,205,289.25	₱866.27	3,389.4	₱812,581.92	₱239.74
1923	5,014.3	4,367,742.20	871.06	3,535.6	955,440.81	270.23
1924	5,213.0	4,461,035.06	855.75	3,840.3	1,028,547.73	267.83
1925	5,517.6	4,801,567.32	870 23	4,281.8	1,071,511.31	250.25
1926	5,846.7	4,638,373.12	793.33	5,044.2	1,031,788.58	204.55

During the year 1926, there was an increase of 182.4 kilometers of first-class roads as shown hereunder:

TABLE 2.—*Increase in first-class road kilometerage during the year 1926*

Provinces	Roads in existence December 31, 1925	Roads in existence December 31, 1926	Increase during the year 1926
	Kms.	*Kms.*	*Kms.*
Abra	58.2	64.4	6.2
Agusan	17.3	....	[a] (17.3)
Albay	198.8	208.2	9.4
Antique	108.8	108.8	....
Baguio	46.9	47.8	.9
Bataan	38.3	38.6	.3
Batangas	199.8	204.5	4.7
Benguet	72.4	72.4	....
Bohol	238.5	244.0	5.5
Bukidnon	....	....	....
Bulacan	116.3	116.3	....
Cagayan	72.8	72.8	....
Camarines Norte	32.3	34.3	2.0
Camarines Sur	155.0	161.2	6.2
Capiz	193.6	201.2	7.6
Cavite	82.4	85.5	3.1
Cebu	334.7	334.7	....
Cotabato	22.1	22.3	.2
Davao	27.0	29.8	2.8
Ilocos Norte	79.8	84.9	5.1
Ilocos Sur	180.3	181.8	1.5
Iloilo	287.1	287.1	....
Isabela	82.1	82.1	....
Laguna	159.8	161.4	1.6
Lanao	44.3	43.4	[b] (.9)
La Union	117.2	117.2	....
Leyte	140.0	140.0	....
Marinduque	51.5	51.5	....
Masbate	34.6	36.0	1.4
Mindoro	24.4	40.2	15.8
Misamis	113.7	122.0	8.3
Mountain Province	....	....	....
Nueva Ecija	189.5	199.2	9.7
Nueva Vizcaya	42.7	49.8	7.1
Occidental Negros	348.9	360.9	12.0
Oriental Negros	161.1	173.6	12.5
Palawan	....	....	....
Pampanga	201.1	201.1	....
Pangasinan	472.9	489.8	16.9
Rizal	184.1	185.5	1.4
Romblon	....	....	....
Samar	107.5	108.3	.8
Sorsogon	105.3	118.7	13.4
Sulu	18.3	26.8	8.5
Surigao	54.3	54.3	....
Tarlac	145.5	160.8	15.3
Tayabas	181.6	193.2	11.6
Zambales	59.6	68.2	8.6
Zamboanga	61.9	62.1	.2
Total	5,664.3	5,846.7	182.4

[a] Decrease due to reclassification of roads.
[b] Decrease due to remeasurement of roads.

In addition to the regular maintenance work, improvements were made on many sections of old roads which carry heavy traffic, including the widening of roadbeds, culverts and bridges, eliminating sharp curves and replacing temporary structures with permanent ones. In Rizal Province 4.29 kilometers of main traveled roads through towns were reconstructed with asphalt macadam and in Iloilo Province the old water-bound macadam road from Iloilo to Jaro was replaced with 1 kilometer of concrete pavement and 1.7 kilometers of asphalt pavement. The hard surface pavements thus far constructed have fully demonstrated the advantages of this type of construction not only from the standpoint of durability and low maintenance cost but as a means of eliminating the dust nuisance. In view of the limited amount of funds available for this purpose, an effort is being made in most of the provinces to have at least a surface treatment of asphalt applied to sections of important roads through towns until such time as available funds will permit a better type of construction.

The standard road direction and warning sings, adopted during 1925, were placed on all the more important roads during the year.

The following are the important road construction projects undertaken during the year:

Cagayan Valley Road, Nueva Ecija Province.—The section under construction in the Province of Nueva Ecija is known as the San Jose–Santa Fe Road and is 58 kilometers in length. During 1926, 4,220 linear meters of subgrade were widened to a 6-meter roadway between Km. 190 and Km. 195, and 3,000 linear meters widened between Km. 201 and Km. 204 and a contract awarded for the widening of the section from Km. 196 to Km. 199. This work exhausted the total appropriation of ₱58,032.15. The status of construction at the close of the year was: first class, 25 kilometers; second class, 6-meter subgrade, 15 kilometers; and third class, 4-meter subgrade, 18 kilometers. Total expenditures to December 31, 1926, was ₱1,316,812.21. This expenditure includes the cost of constructing the Kabolinaoan River Bridge consisting of three 12-meter spans, reinforced concrete slab and girder type on concrete piers and abutments, and the Digdig Bridge, consisting of one 48.77 meter steel truss span and two 8-meter approach spans, reinforced concrete salb and girder type on concrete piers and abutments. The cost of these two bridges was ₱24,500 and ₱60,191, respectively.

Cagayan Valley Road, Nueva Vizcaya Province.—The section under construction in the Province of Nueva Vizcaya is known as the Bayombong–Santa Fe Road. The following work was accomplished: 4,840 linear meters between Km. 258 and Km. 263 and 4,640 linear meters between Km. 233 and Km. 238, were built first class; the subgrade on the following sections was widened to a 6-meter roadway; Km. 220.06 to Km. 220.59, Km. 221.10 to Km. 221.845, Km. 222.96 to Km. 224.60, and Km. 226.24 to Km. 226.44, giving a total of 3,115 linear meters of completed subgrade. This work cost ₱45,172.70.

With the completion of the remaining 2.32 kilometers of the Bayombong–San Luis Section of this road during the year, the entire section from Bayombong to the boundary of Isabela Province has now become a first-class road. The amount of ₱19,515.71 was expended on the 2.32 Kilometers.

Cagayan Valley Road, Isabela Province.—Construction work was largely confined to the Cauayan–Ilagan Section, 33 kilometers long, the work accomplished comprised the completion of the subgrade, the construction of temporary bridges and the surfacing 16 kilometers of road. This work exhausted the total appropriation of ₱94,081.84 available for 1926.

Gagayan Valley Road, Cagayan Province.—The work consisted in completing the subgrade work between Cattarian and Lal-lo, including the rocky section at Magapit. The entire subgrade from Alcala to Lal-lo, 44 kilometers in length including the construction of wooden bridges, was completed last November, thus making the entire section passable for automobile traffic. It is now possible to motor from Manila to Aparri, a total distance of approximately 575 kilometers. The average cost for building the subgrade ranged from ₱0.55 to ₱0.66 per cubic meter of material moved. The work was done by the "paquiao" system.

Bataan–Zambales Interprovincial Road.—On account of the limited funds available, only a trail 1.5 meters wide was constructed in Bataan Province. The trail follows the approved road location so that it can later be widened to the standard width required for a first-class road, when more funds are provided. During the year 9 kilometers of trail were opened at a total cost of ₱15,692.84.

In Zambales Province, the construction of this road was started at Subic and 2,000 linear meters of subgrade were completed between Subic and Olongapo at a cost of ₱9,244.

Tarlac–Camiling Road, Tarlac Province.—This road is a part of the Tarlac–Pangasinan Interprovincial Road. The Tarlac–Nambalan

Km. 605, Bangui–Claveria Inter-Provincial Road, Ilocos Norte Province (under construction)

Section is 21.67 kilometers long and the subgrade was completed in May, 1926. This permitted direct traffic during the dry season between Tarlac and Camiling, a distance of 34 kilometers, where the former route via Bayambang, Bautista, and Rosales required approximately 3½ hours by automobile to cover a total distance of 108 kilometers. The expenditure during the year was ₱34,303.

Burgos–Dasol–Infanta Road, Pangasinan Province.—This is the connecting link on the Pangasinan side of the Pangasinan–Zambales Interprovincial Road. The distance is about 40 kilometers from Burgos to the boundary between the two provinces, 9 kilometers of which have already been declared first class. The work done during the year consisted in constructing 3 more kilometers of first-class road and 2 kilometers of subgrade. The amount spent was ₱25,334.25.

Bongabong–Baler Trail.—This trail will provide on overland connection between Nueva Ecija and the east coast of Luzon, and will eventually be converted into a second-class road. From Bongabong to the Tayabas boundary the distance is 30 kilometers and from the boundary to Baler it is 75 kilometers. The survey was completed and 6 kilometers of subgrade 4 meters wide built in Nueva Ecija during the year. The amount expended was ₱13,291.77.

Cabanatuan–Bongabong Road, Nueva Ecija Province.—This road is a section of the Interprovincial Road to Tayabas Province. Four kilometers were declared first class during the year. The amount spent was ₱20,004.40.

Camarines Sur–Camarines Norte Interprovincial Road.—The necessary investigations and surveys were completed during the year but very little construction work accomplished. This road is approximately 80 kilometers long and when completed will open up large tracts of rich agricultural land and provide an overland outlet for Camarines Norte.

Tanauan–Alaminos Road.—This road will connect the town of Tanauan in Batangas with the town of Alaminos in Laguna. It is 7.36 kilometers long and during the year 3.82 kilometers of subgrade were constructed. The cost, including the delivery of the surfacing material, was ₱8,363.04.

Baybay–Abuyog Road, Leyte Province.—This is a very important project and has been under construction since 1918. It passes through one of the richest hemp regions of the province and will connect the east and west coasts of the island. The total length of the completed road will be 51 kilometers. To date, 7.4 kilometers have been constructed as a first-class road and 21 kilometers as a trail, 5 kilometers of which were constructed during 1926 at a cost of ₱20,600.37.

Ormoc–Capoocan–Carigara Road, Leyte Province.—This is another important road in Leyte to connect the north coast with the west coast, passing through an undeveloped agricultural country. Twelve and eight-tenths kilometers have been graded, two of which have been surfaced. The amount of ₱10,917.16 was spent during 1926.

Loay–Interior Road, Bohol Province.—This important road will connect the north and south coasts of the island of Bohol, passing

Quinoguetan Bridge, Loay Interior Road, Bohol Province

through the center of the island. The road for a distance of 50.6 kilometers extending from Loay on the southern coast to the Government Agricultural Colony, has been declared first class. During the year the road location was completed from the Colony to the north coast, a distance of 24.86 kilometers and the location plan approved.

Carmen–Bacani Road, Bohol Province.—This is another important road in Bohol which will eventually connect the west and east coasts, intersecting the Loay–Interior Road at the town of Carmen near the center of the island. Twenty eight and four-tenths kilometers have been declared first class, six of which were completed during 1926.

Iloilo–Antique Interprovincial Road.—This road, which is the only land connection between the Provinces of Iloilo and Antique, has been practically completed. It is 23.35 kilometers long, of which 12.25 kilometers are within the Province of Iloilo and 11.1 kilometers in Antique.

Tambugan–Gandara or Catbalogan–North Road, Samar Province.—This is by far the most important road project on the island of Samar since it will connect the completed roads in the Calbayog district with the capital of the province. Twenty one and seven-tenths kilometers still remain to be constructed. During 1926, 3.1 kilometers of subgrade and 2.2 kilometers of surfacing on the Calbayog end and 3 kilometers of surfacing on the Catbalogan end were completed.

Catbalogan–Wright–Taft Road, Samar Province.—This road will connect the east coast of the island with the west coast at Catbalogan, the capital of the province. The 3-meter trail between Catbalogan and Wright was widened to a 7-meter roadway and the final location survey between Wright and the barrio of Loquilocon completed during the year. From barrio Loquilocon, it is possible to travel by "baroto," down a large river to the Pacific coast. The section of the road from Catbalogan to the barrio of Loquilocon is therefore considered the more important and will be completed before starting construction beyond this point.

Calapan–Pinamalayan Road, Mindoro Province.—This important road is 69 kilometers long, and will connect the town of Pinamalayan with the capital. On the Pinamalayan side 10.2 kilometers have been graded, 7.7 kilometers of which were surfaced during the year. On the Calapan side 24 kilometers have been completed, 9 kilometers of which were accomplished during the year. The expenditure for this work amounted to ₱70,265.85.

The following tabulation shows the status of all active road construction projects:

Road and bridge construction projects

Province	Project	Length of road	Estimated cost	Total appropriation to Dec. 31, 1926	1926 Appropriation		Expenditures previous to 1926	Expenditures and liabilities during 1926	Work accomplished		Remarks
					Provincial	Insular			Previous to 1926	During 1926	
		Kms.							*Per cent*	*Per cent*	
Abra	Peñarubia-Villaviciosa-Pilar road.	25.0	₱165,000.00	₱40,450.17	₱10,020.21		₱30,429.96	₱8,232.72	75	19	
Do	Bangued-La Paz-Lagayan.	12.5	110,000.00	31,715.75	31,390.90		10,324.85	21,365.95	14	40	
Agusan	Butuan-Cabadbaran	29.0	325,000.00	262,008.30	7,087.82		242,051.53	19,619.65	70	21	
Do	Cabadbaran-Santiago	14.0	180,000.00	14,116.30	13,276.65		730.32	6,032.09		1	
Albay	Naga-Joroan	6.0		43,279.09	18,844.00		22,721.33	20,540.86			
Do	Polangui-Ponso-Nasisi	13.3	39,246.00	32,785.99	19,574.34		14,279.17	19,517.28	50	40	
Do	Guinobatan-Masarawag	5.0		21,071.23	10,569.12		10,436.14	10,627.66	60	30	
Do	Virac-Calolbon	17.0	216,000.00	134,938.78	23,704.60		109,783.17	25,051.36		100	
Do	Pandan-Caramoran	9.4	12,000.00	12,665.91			6,235.41		24		
Do	Viga-Panganiban	4.8	12,458.92	12,924.80			3,108.59	8,964.03	20	30	
Do	Bato-Baras	10.2	2,600.00	2,334.89			1,878.49	408.48		100	
Do	Albay-Sorsogon (Inter-Prov.).	20.5	234,518.51	148,203.81			147,679.39	111.10			
Antique	Patñongon North Road	97.0	600,000.00	255,723.68	12,752.11		242,060.06	13,663.59	40	3	
Do	Antique-Iloilo (Inter-Prov.).	11.1	256,352.94	252,126.66	19,108.85		231,801.06	20,210.14	97	1	
Bataan	Bataan-Zambales (Inter-Prov.)	37.9	313,234.80	75,264.65	15,880.13		59,384.52	15,692.84	18	7	
Batangas	Tanauan-Talisay	15.6	266,527.00	148,328.05	22,500.00		123,734.64	24,318.40	60	17	
Do	Balayan-Calatagan	24.0	300,000.00	105,183.88	18,000.00		63,728.26	35,385.45	34	5	
Do	Rosario-Bolbok	22.5	272,058.00	103,052.75	27,000.00		69,186.49	23,087.15	81	9	
Do	Bauan-Mabini	10.0	40,000.00	10,014.14	2,000.00		7,569.39	1,803.87	8	2	
Do	Batangas-Capitolio	.3	13,500.00	11,800.45	8,200.00		2,958.42	7,961.31	5	75	
Do	Tanauan-Alaminos (Inter-Prov.)	9.0	118,963.00	18,432.33	18,000.00			8,363.04		8	
Do	Lipa-Balete	12.0	98,192.00	58,394.13			58,024.24	328.06	40	5	
Do	Batangas-Taysan	12.0	120,000.00	18,794.53			14,433.75	210.00	8		
Do	Taal-San Luis	3.0	82,096.00	9,007.20	9,000.00			558.94			
Do	Banaybanay-Lipa		200,000.00	500.00	500.00			24.00			Survey not completed.
Do	Bolbok-Tayabas Boundary.	4.0	25,444.00	9,000.00	9,000.00			433.00			
Bulacan	Sibul-Biak-na-bato	7.0	87,900.00	27,303.62	5,052.00		22,170.56	5,023.15	(a)	(a)	
Bohol	Loay-Interior (Colony-Ipil section)		265,098.00	377,450.50	47,994.00		329,456.50	18,677.62	98		Construction of Quinogatan Bridge only.
Do	Bacani-Carmen	28.1	249,990.00	186,253.47	23,124.11		163,129.36	30,128.22	80	16	
Do	Carmen-Sierra Bullones	12.0	47,255.00	15,416.09	9,340.99		6,075.10	8,628.36	40	25	
Do	Corella-Sikatuna	8.0	26,418.00	16,437.30	8,593.27		7,844.03	6,717.41	30	25	
Cagayan	Cagayan-Valley	117.0	800,000.00	555,880.40	129,676.65		426,203.75	149,531.20	74	7	
Do	Bangui-Aparri (Inter-Prov.)	54.0	600,000.00	35,060.31	14,093.15		20,967.16	14,066.49	50	20	
Camarines Norte	Talisay-Labo-Paracale	34.4	136,833.00	123,382.58	13,862.62		101,678.28	15,924.88		50	
Do	Camarines Norte-Camarines Sur (Inter-Prov.)	16.0	160,000.00	15,869.82	15,869.82			15,806.67		19	
Do	Labo-Batobalane (Junction).	16.0		2,973.00	2,973.00						
Camarines Sur	Naga-Danao (Junction)	17.4	392,692.00	252,599.44	9,526.89		242,834.67	9,582.82	91	1	
Do	Pili-Bula	7.0	76,264.00	37,316.51	9,413.89		27,753.77	7,635.97	58	10	
Do	Calabanga-Balongay	8.6	72,840.00	13,290.60			13,290.60		58		
Do	Calabanga-Sabang-Embarcadero.	2.0	18,600.00	8,509.67	2,185.63		6,302.67	2,207.00	58	2	
Do	Goa-Tinambac	26.7	270,000.00	14,882.00	425.73		14,322.61	474.25	11		
Do	Milaor-Minalabac	3.0	42,540.00	8,462.73	8,462.73			8,410.43	30	25	
Do	San Isidro-Tubigan	8.3	100,000.00	4,967.57	4,967.57			4,885.75		5	
Do	Camarines Norte-Camarines Sur (Inter-Prov.)	61.0		15,637.91	15,637.91			11,820.50		15	
Capiz	Capiz-Panay-Pontevedra.	21.0	50,000.00	49,049.37	366.12		41,897.82	6,688.55	87	13	
Do	Capiz-Antique (Inter-Prov.)	90.0	1,162,000.00	28,570.89	28,570.89			28,539.83	14	10.8	
Cavite	Naic-Maragondon	8.2	40,000.00	20,632.83	5,899.72		13,339.84	7,290.62	40	20	
Do	Noveleta-Cavite	1.2	50,000.00	42,271.51	1,181.21		28,465.89	13,805.62	100		
Do	Noveleta-Tanza-Amaya	4.5	120,000.00	98,413.11	4,936.68		90,832.16	7,431.39	40	22	
Do	Binakayan-Medicion-Imus.	3.0	12,000.00	6,329.54	1,117.14		4,130.10	2,176.21	20	20	
Do	Pasongkauayan-Buenavista.	3.3	50,000.00	28,414.39	4,229.00		24,184.64	3,996.40	91	4	
Cebu	Reconstruction Cebu North Road and Bridges.	128.0	892,158.00	812,859.59	10,716.44		79,076.93	22,098.66	95	1	12 R. C. culverts constructed during the year total span 16.1 m.
Do	Reconstruction Cebu South Road and Bridges.	133.0	624,564.00	274,534.13	24,562.87		249,971.26	17,074.84	58		
Do	Construction Bridge No. 16.80 (Cebu-Toledo.)	(b)	34,500.00	34,022.38	34,022.38			22,069.45			Construction of approaches—and materials ordered.
Do	Ilihan-Tabogon	11.6	79,959.00	65,026.63	11,083.69		53,464.06	10,786.79	91	9	
Do	Sagay-Bonbon	8.4	67,796.00	63,495.13	9,289.00		49,161.60	14,333.53	90	10	
Cotabato	Lumupog-Bual	12.0	60,000.00	23,643.52	12,595.00		11,048.52	11,558.81	12	7	
Davao	Cuabo-Mati-Boston	219.0	2,000,000.00	167,389.66	26,010.64		141,379.02	26,010.64	37	3	
Do	Davao-North	124.2	350,000.00	68,205.75	9,512.54		58,693.21	8,629.90	14	3	
Do	Davao-South	161.5	400,000.00	194,642.75	19,244.63		175,398.12	19,244.23	44	3	
Ilocos Norte	Piddig-Solsona	10.4	50,000.00	25,744.73			11,424.23	14,280.09	100		
Do	Pinili-Banna-Nueva Era	12.4		27,256.43			1,632.48	24,146.50		100	
Do	Dackel a Danum	5.0	4,000.00	4,090.06	4,090.06			1,837.15		10	
Ilocos Sur	Candon-Galimyod-Bangued.	12.4	98,000.00	28,776.32	22,643.20		6,133.12	22,503.57	2	23	
Do	Construction Butac Bridge.	16.0	30,000.00	17,824.98	17,824.98		143.44	17,314.20		25	Suspension.
Do	Permanent Bridge, Vigan South Road.		93,000.00	34,792.30	10,093.43		24,698.87	9.238.32		100	Box culvert.
Do	Road Diversion to Banaoang Ferry.	3.0	68,000.00	59,108.59	58,470.73		637.86	57,902.09	2	68	
Iloilo	Maasin Weir Site	2.7	10,000.00	10,618.82	10,618.82			10,618.00		100	
Do	Lucena-Jalaud Road Junction.	6.5	15,000.00	7,407.34	407.34			7,400.05		50	
Do	Estancia-Balasan	10.2	27,000.00	28,028.44	28,028.44			18,693.74		55	
Do	Iloilo-Antique (Inter-Prov.)	19.0	644,000.00	306,349.98	49,696.72		254,770.40	48,936.54	80	13	
Do	Janiuay-Lambunao	16.0	170,000.00	96,420.99	153.22		93,612.91	2,783.47	75	3	

[a] Continuos.

[b] 200 meters suspension.

Road and bridge construction projects—Continued

Province	Project	Length of road	Estimated cost	Total appropriation to Dec. 31, 1926	1926 appropriation		Expenditures previous to 1926	Expenditures and liabilities during 1926	Work accomplished		Remarks
					Provincial	Insular			Previous to 1926	During 1926	
		Kms.							*Per cent*	*Per cent*	
Iloilo	Barotac-Nuevo North Road.	57.0	₱655,500.00	₱82,479.37	₱26,527.92	....	₱54,708.93	₱27,757.25	....	30	
Do	Sara-San Dionisio	9.4	75,000.00	64,442.32	12,597.90	....	53,495.55	10,861.93	68	12	
Do	Iloilo Normal School Road.	0.5	15,000.00	8,000.00	....	....	....	7,930.57	....	90	
Do	Iloilo-Jaro Asphalt Road.	2.0	75,000.00	81,421.20	31,873.52	....	20,213.22	56,439.94	....	100	
Do	Iloilo-Jaro Concrete Road.	1.0	36,000.00	38,070.22	38,070.22	....	....	37,608.09	....	100	
Isabela	Cagayan Valley (Cauayan-Ilagan).	34.0	429,200.00	292,708.49	94,081.84	....	193,396.64	130,110.10	55	16	
Do	Cagayan Valley (Ilagan-Cabagan).	40.0	300,000.00	47,390.57	10,420.23	....	36,861.52	10,529.05	38	12	
Do	Angadanan Viejo-Angadanan Nuevo.	5.0	47,800.00	33,943.41	2,737.53	....	29,727.10	4,216.31	70	10	
Laguna	Pagsanjan-Luisiana	18.0	281,410.00	205,577.58	582.04	....	192,585.03	12,814.69	67	7	
Do	Pila-Dayap-Calauan	7.8	85,711.00	85,141.59	46,733.02	....	34,672.77	48,711.35	41	29	
Do	San Pablo-Alaminos	9.0	27,100.00	26,952.03	14,451.34	....	9,096.02	17,842.82	10	22	
Do	Relocation Manila South Road.	2.5	35,000.00	35,895.92	14,208.28	....	13,037.34	21,950.37	61	39	
La Union	Sto. Tomas Road Diversion.	2.0	7,000.00	5,383.12	3,768.13	....	1,614.99	3,751.13	40	40	
Do	Balaoan-Santol	12.0	73,745.00	10,522.35	2,847.41	....	4,994.63	5,010.02	3	10	
Leyte	Baybay-Abuyog	43.3	505,490.00	151,283.85	19,125.70	....	130,300.34	20,675.37	([a])	([a])	
Do	Maasin-Matalon	27.0	240,500.00	162,216.71	17,693.44	....	142,698.73	14,850.29	83	5	
Do	Dulag-Abuyog	34.7	271,500.00	61,295.09	18,235.64	....	37,838.50	20,937.02	20	10	
Do	Ormoc-Capoocan-Carigara.	33.0	55,500.00	63,493.62	10,600.94	....	52,575.16	10,917.16	64	19	
Do	Carigara-Barugo	5.0	20,000.00	19,542.49	9,832.29	....	4,309.13	15,119.80	42	48	
Do	Mayorga (Dulag)-La Paz.	6.1	10,000.00	18,491.37	8,169.86	....	5,840.73	12,168.81	58	32	
Marinduque	Sta. Cruz-Torrijos	28.0	291,903.00	91,243.42	5,924.00	....	85,146.90	6,090.23	22	14	
Do	Malbog-Torrijos	29.0	500,000.00	27,000.00	11,000.00	....	10,907.16	16,047.56	2	2	
Masbate	Masbate-Lumbang	7.0	190,561.00	89,328.50	45,985.04	....	43,343.46	35,086.94	40	35	
Do	San Jacinto-San Fernando.	13.0	27,000.00	26,946.19	24,027.58	....	2,918.61	12,145.63	40	9	
Do	Masbate-Dimasalang	41.2	90,000.00	16,762.83	16,601.29	....	161.54	5,571.78	....	17	Survey not completed.
Mindoro	Calapan-Pinamalayan	65.0	1,391,602.00	371,029.10	31,500.00	....	292,299.55	70,265.85	26	14	
Do	Pola-Jolo	12.0	3,534.00	3,533.76	3,500.00	....	....	832.22	....	2	
Do	Naujan-Jolo	6.0	31,184.00	31,183.99	22,655.90	....	543.10	30,536.28	2	98	
Misamis	Tagoloan-Gingoog	110.0	30,000.00	27,936.98	27,936.98	....	14,955.11	12,968.17	55	20	This is a section of Tagoloan-Gingoog).
Do	Cagayan-Initao	24.0	5,000.00	3,230.43	3,230.43	....	....	3,199.23	....	40	
Do	Talisayan-Balinguan	20.0	21,000.00	20,824.65	20,824.65	....	5,204.88	12,459.72	15	35	
Do	Misamis-North Road	10.0	8,000.00	7,896.82	7,896.82	....	....	7,827.47	....	....	A section only between Tudela-Jimenez.
Mountain	Cabugao-Solsona Trail	120.0	80,000.00	8,691.18	4,138.90	....	4,552.28	2,722.32	10	6	
Nueva Ecija	San Jose-Sta. Fe Interprovincial Road.	58.0	3,200,000.00	[c]1,321,609.79	....	₱58,032.15	1,263,577.64	53,234.57	55	2	
Do	Boñgabon-Baler Trail (N. E.)	30.0	1,500,000.00	[c]13,475.80	....	13,475.80	....	13,291.77	....	5	
Do	Boñgabon-Baler (Tayabas.)	75.0	2,000,000.00	[c]23,459.87	....	23,457.87	....	19,248.53	....	....	
Do	Cabanatuan-Aliaga	11.2	60,000.00	51,795.79	2,116.51	....	49,679.28	2,116.44	90	....	
Do	Talavera-Licab	20.7	135,000.00	127,008.57	11,378.06	....	115,630.51	10,501.32	75	5	
Do	Cabanatuan-Boñgabon	28.0	150,000.00	106,048.03	21,156.06	....	84,891.97	20,004.40	40	5	
Do	Sta. Rosa-Zaragosa	12.0	100,000.00	65,953.46	9,886.56	....	56,066.90	9,663.46	55	....	
Do	San Jose-Lupao-Umingan.	14.6	80,000.00	23,924.58	5,576.29	....	18,348.29	5,508.02	20	10	
Do	Cuyapo-Nampicuan	6.1	70,000.00	11,483.62	5,593.73	....	6,249.89	5,593.66	15	....	
Do	Pinagpanaan-Rizal	12.0	190,000.00	41,990.46	13,188.11	....	28,802.35	13,152.36	13	2	Survey not completed.
Do	Cabu-Rizal	6.0	90,000.00	4,460.05	3,336.93	....	1,123.12	3,336.93	....	5	Do.
Do	Bukot-Zaragoza	3.0	95,815.00	19,754.64	19,754.64	....	....	15,850.60	....	30	Do.
Do	Digdig-Carranglan	15.0	150,000.00	7,543.03	7,543.03	....	....	4,414.98	....	10	
Do	Provincial Bldg. Road	.75	10,000.00	3,163.78	3,163.78	....	....	2,975.42	....	30	
Nueva Vizcaya	Bayombong-Sta. Fe	49.0	490,000.00	[c]97,623.63	....	36,766.52	52,448.90	45,174.70	12	12	
Do	Bayombong-San Luis	46.0	244,671.00	[c]243,402.23	....	14,784.20	223,878.97	19,515.71	94	4	
Occidental Negros	Kabankalan-Ilog	4.4	45,000.00	44,134.99	1,745.49	....	42,324.50	872.59	....	40	
Do	Talisay-Concepcion	12.6	47,000.00	43,473.43	8,347.27	....	35,126.16	6,423.82	82	17	
Do	Talisay-Dos Hermanas	8.0	37,360.00	19,037.27	4,224.78	....	14,760.40	4,094.28	85	15	
Do	La Carlota-La Castellana.	4.1	70,000.00	58,728.31	....	....	57,300.82	1,370.75	81	4	
Do	Kabankalan-Cauayan	18.6	150,000.00	78,645.35	21,165.65	....	54,112.87	21,606.10	74	16	
Do	Bago Bridge Approaches	1.0	190,000.00	190,930.50	11,522.25	....	80,082.97	109,134.92	68	24	
Do	Ma-ao-La Carlota	5.3	42,365.00	32,687.54	9,020.38	....	12,119.62	18,733.95	33	44	
Do	Isabela-Binalbagan	14.0	72,956.00	20,973.45	20,469.28	....	75.80	13,962.54	....	12	
Do	Pontevedra-Antipolo	10.0	33,000.00	8,742.55	....	....	116.54	4,506.36	....	14	
Do	Sumag-Abuanan	11.8	60,000.00	13,714.37	10,705.19	....	166.82	12,849.25	....	21	
Do	Escalante-San Carlos	34.0	386,000.00	74,913.00	57,089.01	....	14,969.13	59,902.62	6	18	
Do	La Castellana-Isabela	12.9	65,000.00	23,408.73	23,408.73	....	....	15,402.54	0	11	
Oriental Negros	Dumaguete-North Road.	117.0	547,576.00	448,970.11	50,384.62	....	298,585.49	50,384.62	66	10	
Do	Guijulngan-Vallehermoso.	33.0	204,000.00	34,025.27	23,810.48	....	10,214.79	23,806.99	6	13	
Do	Tanhay-Pamplona	....	42,000.00	8,465.83	8,465.83	....	....	8,462.75	....	19	
Pampanga	Angeles-Magalan	11.5	136,905.00	80,748.60	15,165.49	....	65,583.11	3,923.45	37	5	
Do	Sta. Rita-Porac	12.1	150,000.00	6,215.65	23.29	....	3,494.54	617.00	....	....	
Do	Arayat-Magalan	15.0	45,000.00	5,146.08	5,146.08	....	....	2,841.86	....	....	
Pangasinan	Binmaley-San Carlos	5.7	113,303.27	50,990.12	664.78	....	50,325.34	460.38	37	0	
Do	Mangatarem-Tarlac	11.7	228,905.00	52,960.74	1,945.30	....	51,015.44	1,835.37	77	10	
Do	Agno-Bani	14.0	177,650.47	65,798.76	6,963.75	....	58,835.01	5,616.80	97	3	
Do	Malasiqui-Villasis	20.2	208,873.98	4,881.24	4,881.24	....	....	4,881.24	....	2	
Do	Burgos-Dasol-Infanta	30.2	281,727.55	50,530.24	28,919.86	....	21,610.38	25,534.45	....	32	
Do	Rosales-Sta. Maria	14.5	256,366.88	28,568.56	22,355.29	....	6,213.27	22,282.49	....	30	
Do	Construction Provincial Boulevard.	1.2	171,886.00	128,712.72	2,749.78	....	125,962.94	2,749.78	56	2	
Rizal	Antipolo-Teresa	7.0	60,000.00	54,961.72	1,000.00	....	53,799.28	1,162.44	90	10	
Do	Tagig-Muntinlupa	....	144,000.00	6,346.18	....	....	6,235.11	53.79	5	....	Survey not finished.
Do	San Felipe Neri-Jolo	4.0	14,000.00	6,186.18	1,000.00	....	5,191.36	994.82	70	10	
Do	Pililla-Jalajala	....	35,000.00	21,112.21	1,213.52	....	19,874.19	1,238.02	30	....	Do.
Do	Provincial Asphalt Rd	4.6	30,000.00	43,778.42	24,500.00	....	15,142.41	28,205.22	40	45	
Do	Morong-Teresa	....	5,000.00	6,757.12	6,757.12	....	....	6,585.99	....	20	Do.
Do	Construction Tinajeros Bridge.	....	25,375.00	29,159.93	29,159.93	....	....	29,159.93	....	100	
Romblon	Carmen-Despujol-Odiongan.	8.84	600,000.00	169,183.24	26,206.47	....	131,616.03	37,420.49	35	13	

[a] Continuous.

[c] Insular.

Road and bridge construction projects—Continued

Province	Project	Length of road	Estimated cost	Total appropriation to Dec. 31, 1926	1926 Appropriation		Expenditures previous to 1926	Expenditures and liabilities during 1926	Work accomplished		Remarks
					Provincial	Insular			Previous to 1926	During 1926	
		Kms.							*Per cent*	*Per cent*	
Romblon	Odioñgan–Looc	25.0	₱45,000.00	₱11,670.02	₱11,078.63	....	....	₱10,820.52	....	39	
Sorsogon	Pili–Castilla	3.7	13,746.00	12,549.87	6,000.00	....	₱6,549.00	5,983.66	65	25	
Do	Sorsogon–Albay	41.0	455,000.00	436,365.35	30,000.00	....	379,440.10	56,146.49	98	1	
Do	Putiao–Pilar–Donsol	29.5	35,927.00	25,774.38	....	....	16,850.94	10,745.23	40	26	
Do	Bulusan–Irosin	16.0	305,535.00	121,015.32	20,000.00	....	97,903.70	22,803.55	90	6	
Do	Juban–Irosin	19.7	250,537.00	61,098.00	40,000.00	....	19,958.16	40,217.16	32	23	
Samar	Catbalogan–North Road	41.8	1,168,000.00	569,993.53	9,335.00	....	547,952.84	13,876.06	47	6	
Do	Catbalogan–South Road	13.6	132,000.00	10,000.00	10,000.00	....	....	7,119.41	....	2	
Do	Allen–Lavezares	9.0	95,000.00	75,116.29	12,000.00	....	63,116.13	11,983.11	66	22	
Do	Sulat–Oras	44.2	40,000.00	34,651.10	13,500.00	....	20,911.43	13,478.44	50	36	
Do	Guiuan–Salcedo	8.5	12,000.00	6,000.00	6,000.00	....	....	5,906.40	....	98	
Do	Tambuñgan–Gandara	9.6	150,000.00	6,000.00	6,000.00	....	....	5,996.82	....	8	
Sulu	Jolo–Bud Daho–Romandier.	16.0	219,894.00	19,280.96	6,959.24	....	12,321.72	6,233.00	12	2	
Do	Jolo–Tagbili	12.5	194,757.00	17,999.46	7,843.65	....	10,155.81	7,409.47	24	2	
Do	Indanan–Silangkan–Parang.	17.5	203,568.00	13,728.49	4,540.38	....	9,188.11	4,414.36	26	2	
Do	Tandu–Batu–Karungdung.	18.0	250,260.00	6,548.27	1,578.02	....	4,970.25	1,432.55	10	2	
Do	Campagayo–Kulaykulay	9.0	299,280.00	6,307.75	3,674.53	....	2,633.22	3,220.83	15	....	
Do	Jolo–Mainbung	16.4	3,000.00	136.63	136.63	....	....	136.63	....	5	
Do	Parang Road	16.2	7,100.00	7,089.35	7,089.35	....	....	7,072.92	....	75	
Do	Junction–2–Siet Lake	28.0	15,000.00	14,806.98	14,806.98	....	....	14,673.04	....	40	
Surigao	Carascal–Cantilan–Lanuza.	25.0	400,000.00	42,124.77	14,500.00	....	26,244.38	14,687.47	8	2	
Do	Placer–Gigaquit	16.0	250,000.00	62,845.42	8,382.00	....	48,818.54	13,970.06	11	1	
Tarlac	Tarlac–Camiling	18.3	146,432.00	34,879.71	34,879.71	....	....	34,879.71	....	39	
Do	Pura–Guimba	8.8	99,548.75	73,559.10	678.88	....	72,880.22	510.66	....	100	
Do	Murcia–Mabalacat	8.76	115,983.00	81,875.94	1,983.50	....	79,892.44	1,043.24	96	1	
Do	Malacampa–Mayantoc	4.2	27,618.00	7,795.58	7,795.58	....	....	7,795.58	....	98	
Do	Paniqui–Ramos	3.6	58,348.00	21,735.30	21,735.30	....	....	21,735.30	....	100	
Tayabas	Panaon–Unisan	5.5	127,686.00	124,695.75	4,620.00	....	117,490.91	7,204.84	56	33	
Do	Lucban–Sampaloc Mauban.	33.4	567,290.00	382,156.47	36,000.00	....	339,404.30	34,829.39	77	6	
Do	Infanta–Puerto	12.0	22,366.00	22,906.03	10,000.00	....	6,671.34	10,211.69	35	2	
Do	Sambat–Tayabas	6.5	13,593.00	13,756.13	3,000.00	....	10,593.08	2,962.38	100	....	
Do	Gumaca–Lopez–Calauag	30.8	7,000.00	7,215.17	7,000.00	....	....	4,130.06	....	3	
Zambales	Subic–Olongapo	12.0	144,000.00	59,412.35	4,616.13	....	54,367.72	4,943.67	14	19	
Do	Iba–South Road	12.38	60,000.00	52,385.90	1,207.08	....	49,026.82	3,354.95	92	....	
Do	Botolan–Binuclutan	3.6	40,000.00	38,429.02	6,129.02	....	869.64	37,272.96	2	64	
Do	Matalvis–Sta. Cruz	48.6	120.000.00	25,294.81	5.19	....	25,283.03	(100.08)	15	....	
Do	Palauig–Matalvis	8.0	80,000.00	36,411.80	26,411.80	....	597.31	26,382.88	2	36	
Do	Zambales–Bataan (Inter-Prov.)	45.0	240,000.00	23,442.34	23,442.34	....	....	9,244.86	14	19	Under investigation.
Zamboanga	Dapitan–Dipolog Road and Trails.	14.5	80.800.00	30,774.22	30,774.22	....	9,601.19	30,774.22	....	85	
Do	San Ramon–Patalon	9.0	80,000.00	10,460.16	10,460.16	....	....	8,541.95	....	30	

BRIDGES

The following are some of the more important bridges constructed or under construction during the year 1926:

Palico Bridge, Batangas Province.—This is a 160-feet steel pin connected truss located on the Batangas–Nasugbu Road. The fabricated steel was furnished by the Atlantic Gulf and Pacific Company at a unit price of ₱0.274 per kilo. The erection was undertaken by administration. The work of tearing down the old wooden truss bridge was started in November, 1925, and the erection of the steel truss was begun during the early part of 1926. The bridge was completed and opened to traffic on March 20, 1926.

Manghinao Bridge, Batangas Province.—This bridge is a 15-meter concrete arch with spandrel walls and approach spans, with a total length of 33 meters. This structure replaced the old Spanish adobe bridge of 9.20 meters span which collapsed due to scouring at the foundation. It is located on Km. 122.2 on the Bauan–Taal road.

The excavation work was started in April, 1926, and actual concreting operations begun during the month of May. The work was carried out by administration. The bridge was completed and opened to traffic on August 15, 1926.

Quinoguitan Bridge No. 29.9, Loay-Interior Road, Bohol Province.—This bridge is a 12-meter arch span on concrete abutments. The construction of this bridge was awarded to Mr. Marcelo Regner of Cebu for the sum of ₱16,685. The total cost of the bridge including surcharges and the construction of the approaches was ₱20,333.78.

Quingua Bridge, Bulacan Province.—This is an old bridge but another steel span of 130 feet had to be added at the north end to provide more waterway and prevent further erosion on the north bank. The furnishing of structural steel was awarded to the Atlantic Gulf and Pacific Company by contract for ₱12,000. The construction of the new abutment and steel span and the repair of the old north abutment were undertaken by administration at a total cost of ₱37,009.81.

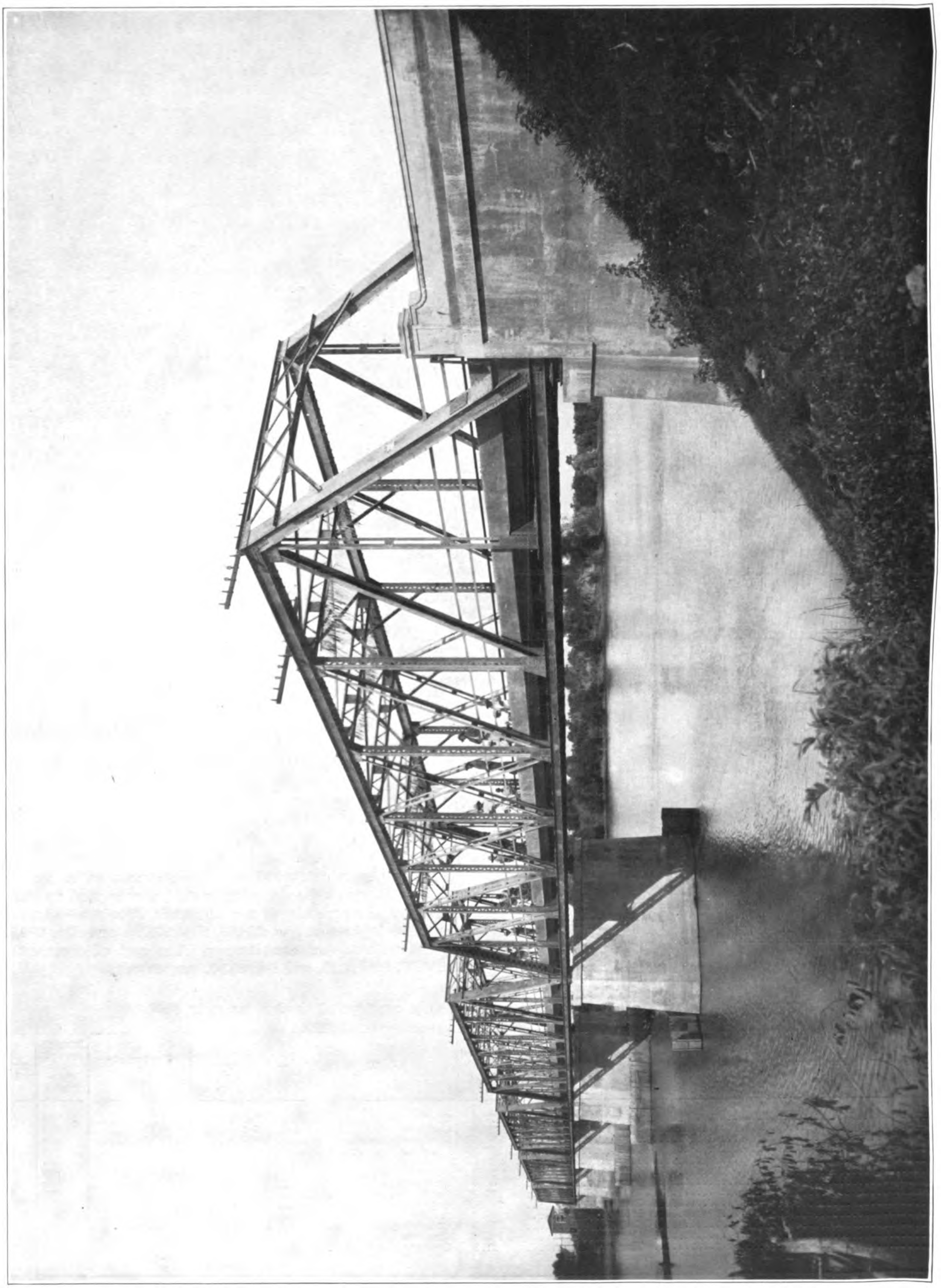
Butac Bridge, Ilocos Sur Province.—Twenty-five per cent of this bridge was completed at the end of the year. Total expenditures and liabilities amounted to ₱17,314.20. The bridge is estimated to cost approximately ₱30,000 when completed. The project is being undertaken by administration.

This is a suspension bridge of 160-foot span with steel towers and rubble masonry abutments. It is located at Km. 388.46 on the Tagudin–Cervantes road.

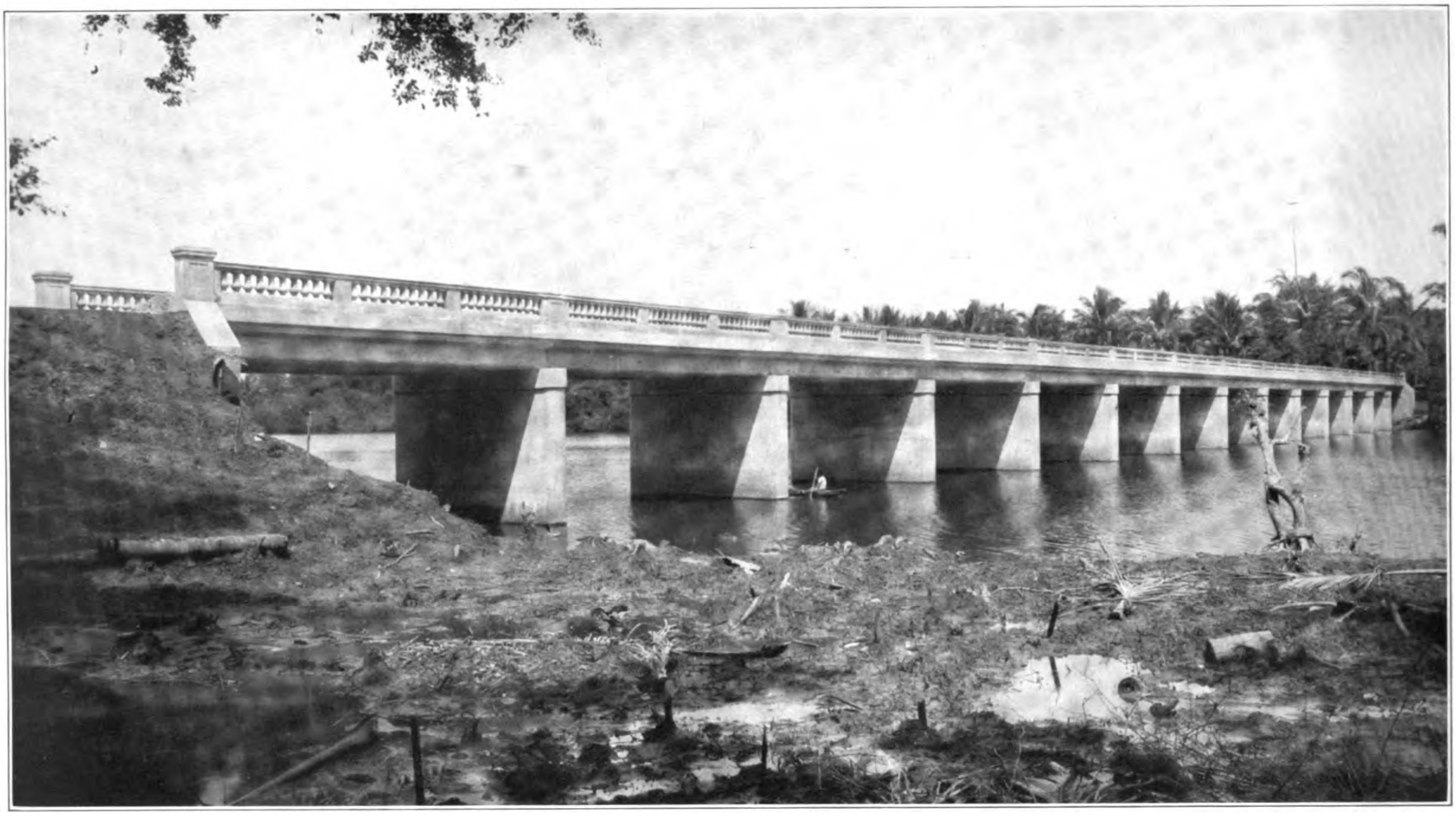
Biñan Suspension Bridge, Laguna Province.—This project was awarded to Mr. Gregorio de Silva for ₱10,500. The work accomplished was the construction of a 110-foot timber suspension bridge which was started on February 12, and completed on March 20, 1926, at a total cost of ₱11,864.56.

Cadael Bridge, La Union Province.—The reconstruction of this bridge was authorized in April. The total sum of ₱10,243.02 was appropriated for the project. The contract was awarded to Mr. Fortunato Concepcion for the sum of ₱8,400, to be completed in 80 working days. Work was started on June 28, 1926, and consisted in constructing complete two reinforced concrete approach spans and the lowering of the old 9.50-meter "I" beam span along with the concrete floor to the newly established bridge seat. Total expenditures and liabilities amounted to ₱10,131.21. This includes surcharges and the lowering of the road to the required grade which was done by administration.

Carmen Bridge, Pangasinan Province.—This bridge consists of thirteen 160-foot steel spans to be erected on twelve concrete piers and two end abutments, with timber pile foundation. The construction of the substructure is being done under contract by Mr. William



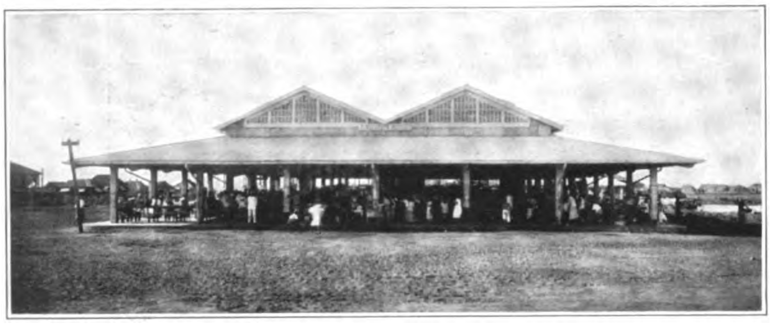
BAGO RIVER BRIDGE, BACOLOD SOUTH ROAD, PROVINCE OF OCCIDENTAL NEGROS



Talaban Dacu River Bridge, Bacolod South Road, Province of Occidental Negros

Anderson for the lump sum of ₱134,994, the work to be finished within 160 working days.

The contract for furnishing the structural steel for the superstructure has been awarded to the Atlantic Gulf and Pacific Company at a unit price of ₱0.177 per kilo, delivery to be made F. O. B., Manila within 220 days. Bids for the transportation and erection of the steel trusses including the laying of the concrete flooring are to be advertised during the early part of next year.



Municipal Market, Aparri, Cagayan Province

Work was started on the substructure on October 13, 1926 and at the end of the year 11 per cent of the work had been completed. The total expenditures and liabilities during the year were ₱344,955.06.

Tinajeros Bridge, Rizal Province.—The reconstruction of this bridge was contracted by Messrs. Tan C. Tee and Company for ₱24,256.30 and the project was completed on November 2, 1926. The work accomplished was the construction of five spans of reinforced concrete slab and girder superstructure, concrete pier caps, and the demolishing of the old Spanish masonry arches. The total cost of the reconstruction work including the construction of the approach walls, which was done by administration, amounted to ₱29,159.93.

Benguet, Subprovince of the Mountain Province.—Three wooden pony truss bridges at Km. 269.65, Km. 251.70, and Km. 253.20 were replaced with 60-foot steel trusses. The cost of construction was ₱6,263.35, ₱5,882.10, and ₱6,128.10, respectively.

Important permanent bridges partially or completely constructed during the year 1926

Provinces	Name	Bridge and kilometer number	Type	Span in meters or feet	Roadway in meters	Percentage of work completed	Total expenditures and liabilities
Batangas	Palico	177.2	Steel truss	1–160 ft.	4.88 M.	100	₱36,120.42
Do	Manghinao	122.2	Concrete arch	1–15.0 m.	4.88 M.	100	24,160.77
Benguet Subprovince		251.70	Steel truss superstructure only	60′–ft.	4.20 M.	100	5,882.10
Do		253.20	do	60′–ft.	4.20 M.	100	6,128.10
Do		289.65	do	60′–ft.	4.20 M.	100	6,263.35
Bohol	Quinoguitan	29.9	Concrete arch	1–12.0 m.	4.88 M.	100	20,333.78
Bulacan	Quingua	43.5	Steel truss	1–160 ft.	16 Ft.	100	37,009.81
Camarines Norte	Talisay	10.04	Pony steel	80′ 0″	16′ 0″	50	30,292.52
Ilocos Sur	Butac	288.4	Suspension	1–160 ft.	9′ 2″	25	17,314.20
Laguna	Biñan	36.0	do	1–110 ft.	9′ 2″	100	11,864.56
La Union	Cadael	273.4	Concrete girder	2–5.35 m.	4.88 M.	100	10,131.21
Pangasinan	Carmen	192.0	Steel truss	13–160 ft.	16 Ft.	11	344,955.06
Rizal	Tinajeros	11.8	Concrete girder	5–12 m.	488 sidewalks 2–1.20 M.	100	29,159.93

Batangas Capitol Building

BUILDINGS

Manila:

The completion of the Legislative Building was the outstanding building construction accomplishment of the year. The Mas Construction Company, of Manila, performed their work in a very satisfactory manner. This is the largest and the finest building in the Islands and the unit cost of approximately ₱31 per cubic meter of inclosed space is considered quite satisfactory in view of the large amount of ornamental finish and special electrical features.

The Mas Construction Company's contract amounted to ₱1,945,885.27, and the total expenditures and obligations for the project were ₱4,075,000. The special chandeliers and indirect lighting fixtures for the Senate Chamber were enroute from the United States at the end of the year, and the elevators were also still on order.

An auxiliary pneumatic water supply system was installed and adequate fire-protection facilities were provided for the building.

The Legislature held its opening session in the new building on July 16, 1926.

The Guazon Memorial Operating Pavilion at the Philippine General Hospital was completed early in the year at a total cost of ₱28,580.66. It is a small concrete unit with a lecture room on the first floor and a modern operating amphitheater on the second floor.

Provinces:

The following are the most important public buildings completed in the provinces during the fiscal year 1926:

Batangas Capitol Building, Batangas Province.—The central unit of this building, consisting of a reinforced concrete structure of special design, composed of a 10.94 by 29.70 meter two-story main building, with a one-story wing, 10 by 34.30 meters on either side and a suitable terrace in front, was completed at the end of the year. It is located on high ground outside of the poblacion proper and the grounds provide ample parks and landscape gardens. The work was done by contract. The total expenditure and liabilities at the end of the year amounted to ₱251,755.29.

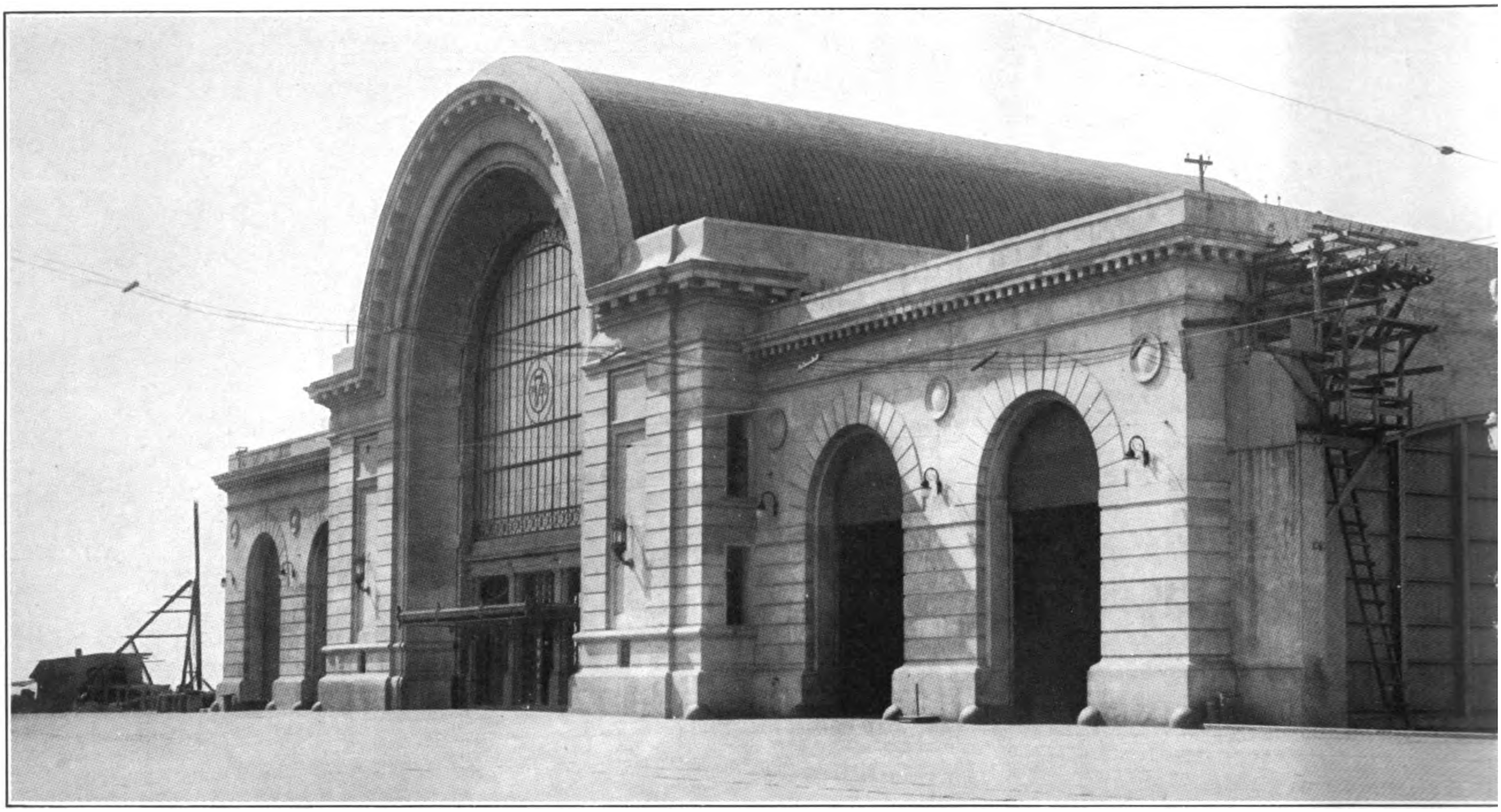
The other two wings, which will complete the U-shaped capitol group will be constructed as soon as funds are available.

Bohol Provincial Girls' Dormitory, Bohol Province.—This is a two-story building, 18.30 by 17.60 meters and will give proper living accomodation to girls attending the high school at Tagbilaran. The project was completed under contract by Messrs. Maxillom and De Leon of Cebu and the total expenditures and liabilities were ₱20,471.52.

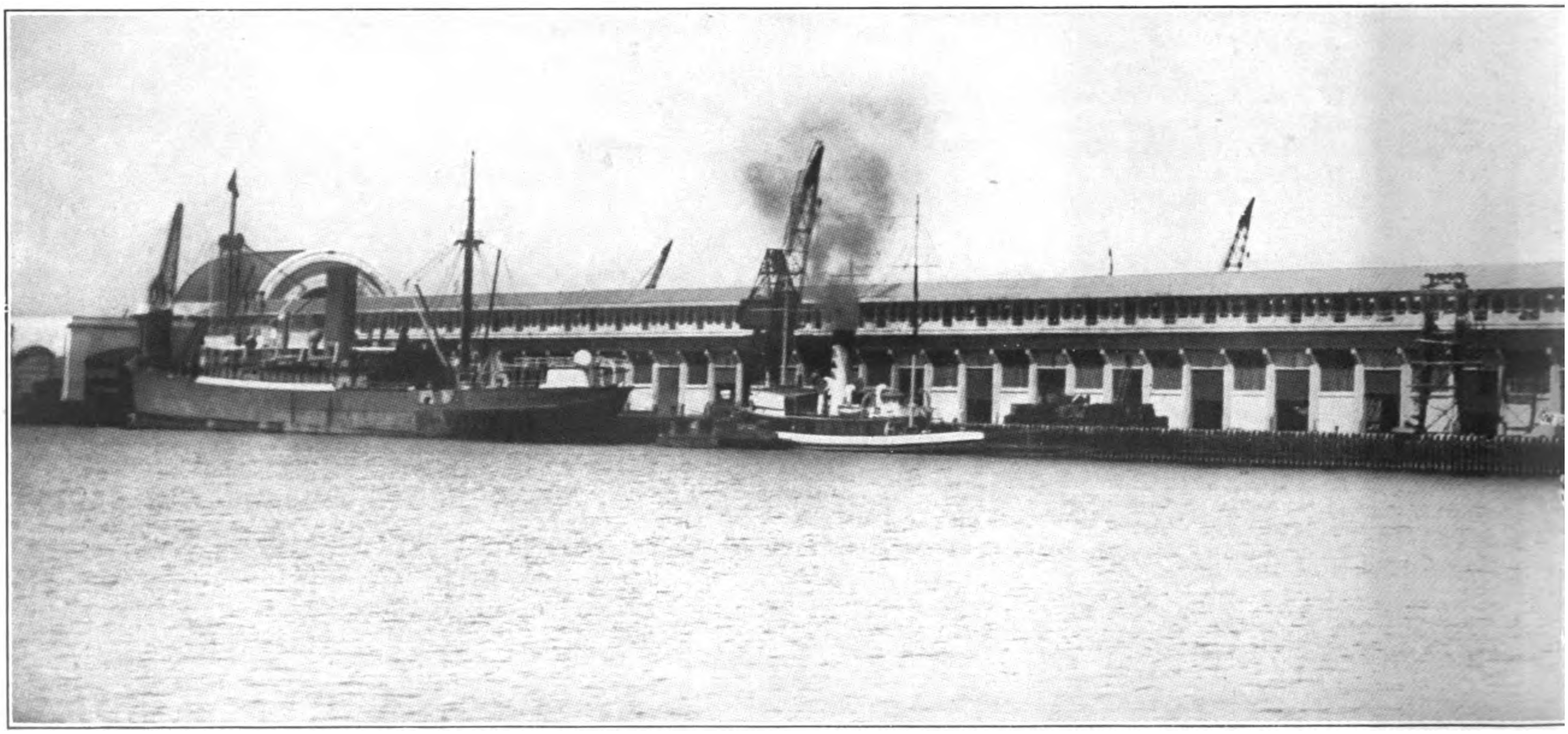
Nurses' Home, Zamboanga General Hospital, Zamboanga Province

Iloilo Normal School, Iloilo Province.—This building is a reinforced concrete structure consisting of one 13.75 by 70.00 meters two-story main building and two 12.17 by 23.15 meter one-story wings. The main building has a galvanized iron roof, while the wings have tile roofs laid over asphalted felt waterproofing. It is the first unit of a U-shaped group. Construction was begun on August 19, 1919, by administration, and after being suspended for a long period due to lack of funds, was completed during 1925 and 1926 under three separate contracts. The total cost of the completed unit was ₱396,019.27.

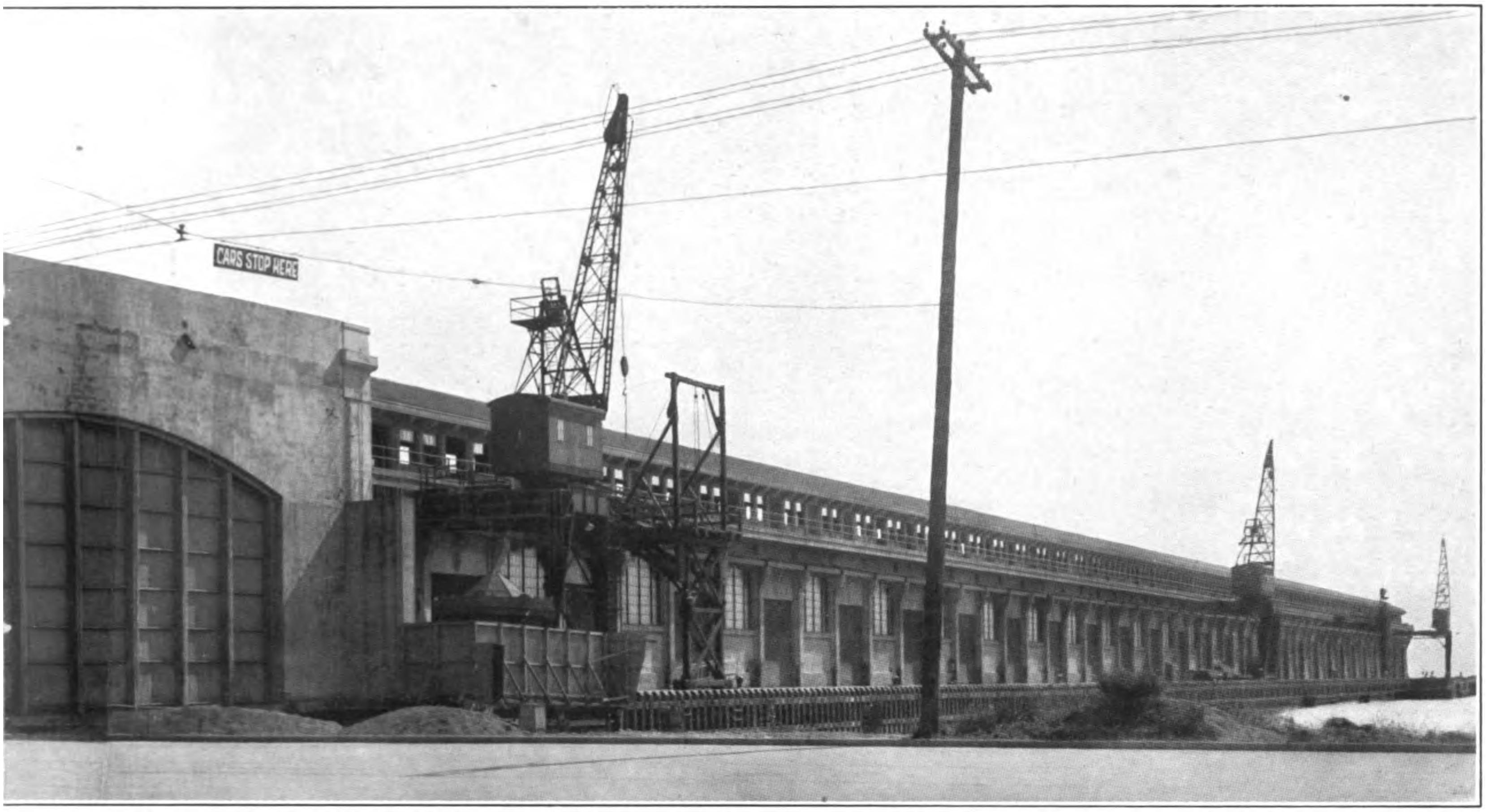
Dagupan Presidencia Building, Pangasinan Province.—This is a two-story building of the "Calbayog" type. The lower story is of con-



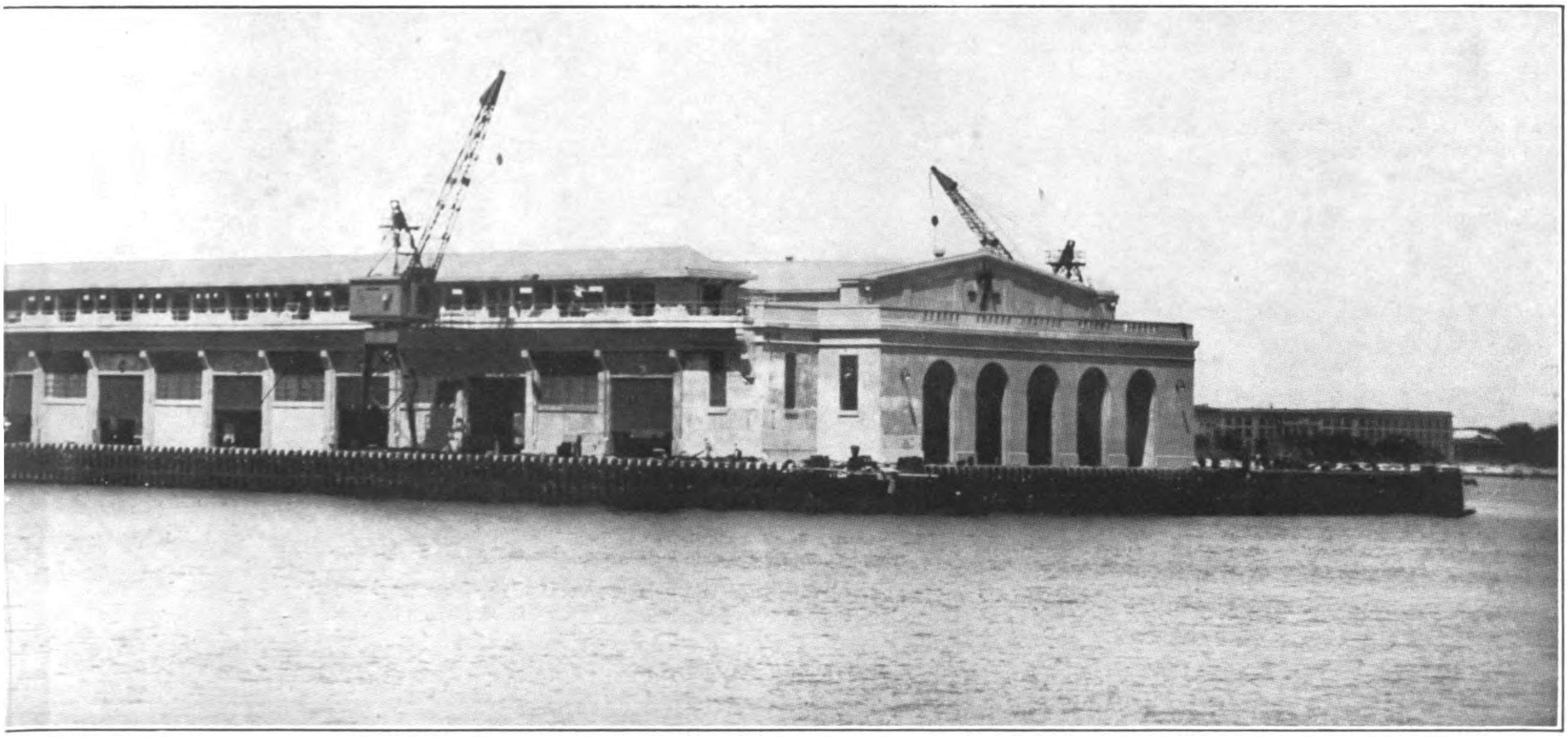
PIER No. 7 SHOWING



VIEW OF PIER N



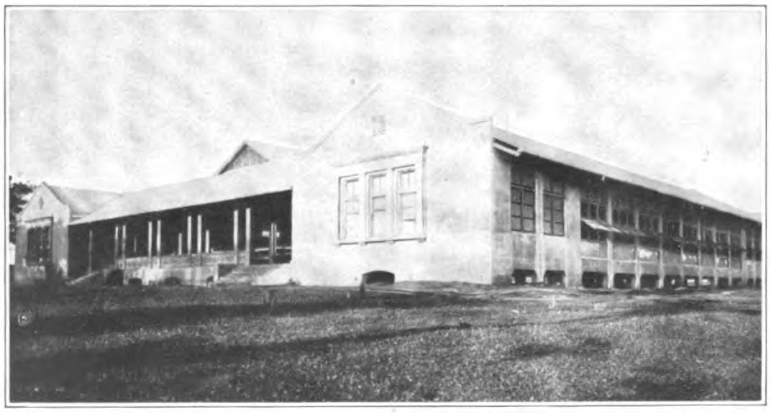
IERHEAD, MANILA



. 7 FROM BAY

Lopez Municipal Building, Tayabas Province

crete and is occupied by the treasurer, post office, police and jail· the second story is of wood and provides offices for the president, secretary, health officer and a session hall. Its outside dimensions are 24.20 by 12.80 meters. This project was completed by contract at a cost of ₱39,380.



Ilagan High School, Isabela Province

Tarlac Provincial Courthouse, Tarlac Province.—This project consists of the construction of a first floor lobby and the addition of a second floor to the Tarlac Jail Building. The work was done by administration, as the bids received were not considered advantageous. Construction was started on August 2, 1926, and was completed on November 6, of the same year, at a total cost of ₱39,334.64, which is ₱9,759.11 less than the proposal of the lowest bidder.

The new addition provides offices for the judge of the Court of First Instance, provincial fiscal, the registrar of deeds, the clerk of court, the sheriff and a session room for the court.

Lopez Presidencia, Tayabas Province.—This structure is of the "Davao" type. It is a two-story concrete building, with outside dimensions of 24.80 by 12.40 meters. The work was done under contract at a total cost of ₱44,783.76, including the installation of electrical wiring. The building was inaugurated on June 19 and immediately occupied by the municipal authorities.

Ward Pavilion, Lucena, Tayabas Province.—This is a one-story concrete building with galvanized iron roofing and comprises "Stage No. IV" of the Standard Plan for Provincial Hospitals. Its principal dimensions are 14.70 by 7.40 meters and 7.40 by 9.90 meters. Its construction, including the instalation of electrical wiring, was accomplished by contract at a total cost of ₱21,533.

The following buildings were completed in 1926:

Hospitals

Province	Municipality	Buildings	Type and materials used	Principal dimension in meters	Contents (in cu. m.)	Cost
Ilocos Sur	Cervantes	1	Stone, brick, concrete and wood with G. I. roof 2-story	11.00×23.00	2,030.0	₱36,664.32
Lanao	Momungan	1	Concrete and wood with G. I. roof. (Dispensary)	9.50×5.50	264.3	1,999.73
Pangasinan	Dagupan	Stage No. 3	Concrete with G. I. roof. (Dispensary)	Special Plan, B. P. W.	1,252.3	20,237.10

School buildings

Province	Municipality	Buildings	Type and materials used	Principal Dimension in meters	Contents (in cu. m.)	Cost
Albay	Mariroc, Tabaco	1	Concrete and wood with G. I. roof	9.20×14.20	858.2	₱4,720.00
Bataan	Hermosa	Add. rooms	do	7.90×21.00	1,760.0	6,731.43
Do.	Orani	do	do	7.00× 9.20	570.0	3,477.03
Do.	Orion	1	do	7.90× 6.90	553.5	3,208.41
Batangas	Batangas	1	Concrete and wood with G. I. roof B. E. Plan No. 10	28.00×12.20 2–10.70×11.10	4,508.6	21,356.63
Do.	Lipa	Add. rooms	do	2–11.00×21.00	2,540.6	16,088.72
Do.	Ibaan	1	do	12.20×21.20	1,924.8	9,825.09
Do.	Batangas	Add. rooms	do	38.70×11.20 35.20×11.20	6,733.4	30,348.41
Do.	Ibaan	1	Concrete and wood with G. I. roof (Domestic Science)	3.50× 1.00 7.00×12.50	525.3	4,437.34
Do.	Labo	Add. rooms	Concrete and wood with G. I. roof B. E. Plan No. 10	7.20× 9.20	472.1	4,098.02
Do.	Rosario	1	do	28.00×12.20 2–17.70×11.20	5,435.8	26,785.41
Do.	do	1	Concrete and wood with G. I. roof (Domestic Science)	3.50× 1.00 7.00×12.50	525.3	5,413.52
Bohol	Guindulman	1	Concrete and wood with G. I. roof B. E. Plan No. 10	9.20×14.00	1,018.8	7,354.32
Do	Tagbilaran	1	Concrete and wood with G. I. roof B. E. Plan No. 10–A	39.70×24.90	5,033.0	31,966.15
Bulacan	Malolos	Dom. Science	do	17.50×11.20	1,180.0	12,640.00
Camarines Norte	Daet	1	do	28.00×12.25 2–24.90×11.70	8,489.4	43,111.79
Capiz	Pontevedra	1	Concrete and wood with G. I. roof	12.20×14.20	1,402.3	6,221.33
Do.	Capiz	1	Concrete with G. I. roof	11.80×14.20	1,314.4	7,765.04
Cavite	Rosario	1	Concrete with G. I. roof B. E. Plan No. 3	18.20× 7.20	1,126.0	8,190.30
Do.	Maragondon	1	Adobe and wood with G. I. roof B. E. Plan No. 7	21.20× 9.20	1,720.4	12,730.21
Do.	Amadeo	1	do	28.00×12.20	2,444.5	16,026.40
Do.	General Trias	Add. rooms	Adobe and wood with G. I. roof B. E. Standard Plan No. 7.	14.20× 9.20	892.3	4,604.89
Do.	Ternate	1	Adobe and wood with G. I. roof B. E. Plan No. 4, (One unit).	9.20× 9.00	558.6	3,423.50
Davao	Sirawan	1	Adobe and wood with G. I. roof B. E. Standard Plan No. 1.	9.00× 9.00	567.0	2,940.44
Ilocos Norte	Badoc	1	Brick and concrete with G. I. roof (Reconstruction)	9.10×30.50 4.80× 4.60	1,830.2	6,136.72
Do.	Bangui	1	Concrete and wood with G. I. roof B. E. Plan No. 10	29.20×21.20 20.80×12.20 9.20× 7.00	4,244.7	25,982.38
Iloilo	La Paz	1 Normal	Concrete with G. I. roof (Special design 2-story)	70.40×13.50 2–12.70×23.80	17,729.0	396.983.69
Do.	do	1 Trades	Concrete and wood with G. I. roof	7.00×12.00 11.00×31.50	3,211.0	17,528.47
Do.	do	Add. rooms	Concrete with G. I. roof	9.20×36.00	2,371.2	14,760.87
Do.	Pototan	1	do	10.00×45.40 9.20×12.20	4,230.8	17,517.92
Laguna	Santa Cruz	Dom. Science	do	8.60×14.30	2,782.0	23,041.06
Lanao	Iligan	1	Concrete with G. I. roof B. E. Standard Plan No. 6	32.20×14.20	2,635.8	20,028.75
La Union	Agoo	Add. rooms	Masonry and wood with G. I. roof	13.90×10.51	1,036.6	5,482.88
Do.	San Juan	do	do	14.80×10.20	1,035.3	4,691.62
Do.	Agoo	do	Rubble masonry and wood with G. I. roof	13.90×10.51	1,036.6	5,482.88
Do.	San Juan	do	do	14.80×10.20	1,035.3	5,763.43
Do.	Luna	do	Concrete and wood with G. I. roof	14.10×11.20	939.1	6,707.47
Do.	Bacnotan	do	Rubble masonry, brick, and concrete with G. I. roof	9.60× 8.75	439.4	4,372.01
Leyte	Alangalang	1	Concrete and wood with G. I. roof B. E. Plan No. 10	12.00×28.00	2,185.7	12,840.01
Marinduque	Buenavista	1	do	7.00×12.00	609.0	3,953.28
Do.	Boac	Add. rooms	do	28.00×12.00	2,436.0	9,321.11
Do.	Gasan	1	do	14.00×12.00	1,218.0	6,701.18
Masbate	Masbate	1	do	12.00×28.00	2,208.0	3,062.69
Mindoro	Looc, Lubang Island	1	Concrete and wood with G. I. roof	9.00× 9.00	486.0	2,559.18
Do.	Mansalay, Bulalacao	1	Concrete and wood with G. I. roof B. E. Plan No. 4	32.00× 9.00	1,707.0	10,051.49
Misamis	Misamis	Dom. Science	Concrete and wood with G. I. roof	9.00×16.00	914.9	5,502.70
Do.	Initao	1	Concrete and wood with G. I. roof B. E. Plan No. 10	28.00×12.00	2,463.3	13,100.00
Occidental Negros	La Carlota	Add. rooms	Concrete with G. I. roof B. E. Plan No. 20	14.00×11.50	1,106.9	8,362.14
Oriental Negros	Manhuyud	1	Concrete and wood with G. I. roof B. E. Plan No 10	50.00×17.50	5,033.3	23,127.56
Do.	Bais	Add. rooms	Concrete with G. I. roof	11.20×14.20	827.3	7,986.33
Palawan	Bacuit	1	Concrete and wood with G. I. roof	9.20×32.20	2,025.2	14,875.55
Pangasinan	Domalandan, Lingayen	Add. rooms	Concrete with G. I. roof B. E. Plan No. 7	8.16× 9.10	969.3	7,833.58
Do.	San Carlos	1	Concrete and wood with G. I. roof (Reconstruction)	7.85×14.20	2,603.5	6,350.20
Do.	Bayambang	1	Concrete, wood and sawale with G. I. roof (Special Plan D. E.)	9.20×14.00	746.4	4,434.90
Do.	San Manuel	Add. rooms	Concrete with G. I. roof—2 story	11.50×14.20	1,118.6	6,772.04
Do.	Sual	1	Concrete with G. I. roof B. E. Plan No. 6	14.20×32.20	2,105.1	18,935.67
Do.	Calasiao	Add. rooms	Concrete with G. I. roof	11.60×28.10	3,176.2	13,845.34
Do.	San Carlos	do	Concrete with G. I. roof B. E. Plan No. 7	11.60×21.00	1,769.3	11,335.13
Do.	Laoac, Manaoag	1	Concrete and wood with G. I. roof B. E. Plan No. 10	12.20×14.20	1,591.4	5,781.57
Rizal	Jalajala	1	Concrete and wood with G. I. roof B. E. Standard Plan No. 4–A.	32.15× 9.15	1,974.2	8,946.00
Do.	Tanay	Extension	Concrete with G. I. roof B. E. Standard Plan No. 5	9.10× 9.20	571.4	5,001.68
Do.	Antipolo	1	Concrete with G. I. roof (Reconst) B. E. Standard Plan No. 3.	9.20×30.20	1,833.7	9,294.14
Do.	Malabon	Add. rooms	Concrete and wood with G. I. roof 2-story (District Engineer plan.)	7.10× 9.20	665.7	5,308.38
Romblon	Cajidiocan	1	Concrete and wood with G. I. roof	13.50×36.00	2,630.2	12,760.67
Samar	Llorente	1	Concrete with G. I. roof B. E. Standard Plan No. 7	39.20×14.20	3,540.0	22,877.02
Sorsogon	Sorsogon	Trade	Concrete with G. I. roof	10.40×41.10	2,622.2	16,200.00
Tarlac	Victoria	1	do	11.50× 7.00	1,135.1	6,466.70
Do.	Tarlac	1	do	14.00×11.00	982.5	12,326.52
Zambales	Subic	1	Concrete and wood with G. I. roof—2 story	36.00×22.00	8,284.3	21,193.90

Temporary school buildings

Province	Municipality	Buildings	Type and materials used	Principal dimension in meters	Contents (in cu. m.)	Cost
Camarines Norte	Alawihao, Daet	1	Concrete and wood with nipa roof	18.00× 9.00	1,241.4	₱2,703.82
Iloilo	Jordan	2	do	18.00× 9.20 13.70× 9.20	3,912.0	18,644.86
Pangasinan	Lingayen	1	Bamboo with nipa roof B. E. Plan No. 10	2–11.20×56.20 12.20×28.20	3,358.1	3,272.20

Municipal Building, Dagupan, Pangasinan Province

Presidencia buildings

Province	Municipality	Buildings	Type and materials used	Principal dimension in meters	Contents (in cu. m.)	Cost
Antique	Tibiao	1	Concrete and wood with G. I. roof, 2-story	6.80×11.80	767.4	₱12,065.83
Batangas	Calaca	1	do	16.10× 8.10	1,390.9	17,417.95
Bohol	Dimiao	1	do	11.90×18.15	2,565.8	9,312.60
Cagayan	Alcala	1	do	7.00× 7.50	951.9	13,547.57
Cebu	Compostela	1	Concrete with G. I. roof, 2-story	9.00×14.00	1,437.9	14,825.78
Do	Santender	1	Concrete and wood with G. I. roof, 2-story	8.10×16.00	782.5	17,595.94
Davao	Davao	1	do	24.80×12.40	3,567.4	46,393.00
Occidental Negros	La Castellana	1	do	8.10×16.10	2,628.0	13,400.00
Do	Cadiz	Extension	do	16.10× 8.10	2,628.0	20,944.00
Pangasinan	Dagupan	1	Concrete with G. I. roof, 2-story	13.00×24.20 14.80×26.00	3,667.0	47,166.48
Do	Pozorrubio	1	Concrete with G. I. roof (Gumaca type), 2-story	8.60×18.30 10.30×20.00	1,909.7	20,972.25
Do	Balungao	1	Concrete with G. I. roof (Clarin type), 2-story	7.10×12.10 8.20×23.20	1,267.2	10,492.27
Rizal	Pateros	1	Concrete and wood with G. I. roof, 2-story	12.00× 7.00 13.20× 8.20	828.4	9,320.21
Do	San Felipe Neri	1	do	12.00× 7.00 13.20× 8.20	828.4	10,323.46
Tayabas	Infanta	1	Concrete with G. I. roof, 2-story	10.30×20.00	1,957.0	24,390.00
Do	Lopez	1	do	12.40×24.80	3,621.0	47,999.00

Market buildings and tiendas

Province	Municipality	Buildings	Type and materials used	Principal dimension in meters	Contents (in cu. m.)	Cost
Albay	Ligao	1	Concrete with G. I. roof	8.20×44.70	1,730.6	₱14,950.00
Batangas	Batangas	1	Concrete with G. I. roof (Special Plan)	68.60×18.00	6,409.9	16,838.99
Benguet	Baguio City	1	Concrete with G. I. roof	4.00×12.00	175.2	775.19
Camarines Norte	Indan	1	do	25.50×12.00	1,680.3	9,555.22
Cebu	San Nicolas, Cebu	1	Concrete with G. I. roof (Type A)	24.00×46.50	6,759.7	21,266.82
Ilocos Norte	Badoc	1 Tienda	Brick and Concrete with G. I. roof (reconstuction)	10.70× 6.80	283.8	3,095.53
Iloilo	Iloilo	Tienda	Concrete with G. I. roof (Standard tiendas)	8.00×39.70	1,852.5	11,094.00
Do	do	2 Tiendas	do	8.00× 9.50 8.00×39.00	1,545.9	12,222.46
Laguna	Majayjay	1	do	9.90×17.59	890.2	12,009.96
Do	San Pablo	Matadero	do	9.50× 8.90	575.8	4,075.59
Leyte	Ormoc	1 Tienda	do	4.40×32.40	539.1	12,216.75
Nueva Ecija	Santo Domingo	1	do	27.00×15.00	1,894.1	7,869.30
Do	Muñoz	1	do	17.50×27.00	3,356.7	14,501.46
Nueva Vizcaya	Solano	Matadero	do	12.20× 8.90	384.0	2,220.25
Occidental Negros	Silay	2 Tiendas	Concrete with G. I. roof (Standard single tienda)	2–5.40×32.70	1,615.4	18,561.63
Do	Cadiz	Tienda	do	5.40×24.70	609.0	8,674.00
Do	Saravia	1	Concrete with G. I. roof	21.00×35.10	3,283.2	21,740.25
Pangasinan	Umingan	1	Concrete and G. I. roof (Type B)	21.00×39.80	4,793.4	20,276.97
Sorsogon	Bulan	1	do	12.00×30.00	1,293.0	8,974.46
Tarlac	San Manuel	1	Wooden with G. I. roof	6.00× 9.00	331.8	181.84
Do	Pura	1	do	11.00×14.00	742.0	1,015.63
Do	Concepcion	1	Concrete with G. I. roof	24.00×42.00	5,291.0	6,369.60

Concrete Apron Extension Pier No. 5, Manila

Miscellaneous

Province	Municipality	Buildings	Type and materials used	Principal Dimension in meters	Contents (in cu. m.)	Cost
Benguet	Baguio, City	1	Concrete and wood with G. I. roof (Cottage for city attorney).	7.00×10.50	356.3	₱4,394.79
Do.	do	1	Concrete and wood with wood and certainteed roof (Cottage for city nurse).	6.10× 6.10	215.5	1,694.53
Do.	do	1	Concrete and gravel with G. I. roof (Temporary rice shed).	3.00×42.00	323.8	1,110.00
Bohol	Tagbilaran	1	Concrete and wood with G. I. roof (Doctors' Quarters)	7.00×10.50	475.4	4,259.30
Do.	do	1	Concrete and wood with G. I. roof (Girl's dormitory—2-story).	18.30×17.60	2,141.4	20,312.38
Cagayan	Tuguegarao	1	Concrete with G. I. roof (Kitchen for Constabulary barracks).	5.00× 5.50	163.3	3,669.72
Cavite	Indang	1	Concrete and wood with G. I. roof (B. P. W. Plan Set175).	11.10× 6.60	644.4	4,509.72
Manila	Manila	Guazon Memorial.	Concrete with concrete and copper roof	11.60× 9.40	1,389.2	30,000.00
Do.	do	Insular	Concrete with G. I. roof, 3-story	107.75×62.23	131,806.6	4,075,000.00
Nueva Vizcaya	Bayombong	1	Concrete with G. I. roof, 2-story	15.35×21.95	3,417.9	38,792.88
Occidental Negros	Bacolod	2	Concrete and wood with G. I. roof, 2-story	12.10×14.10 4.00× 4.00	1,737.0	9,900.00
Rizal	Pasig	Prov. Jail	Concrete with G. I. roof, 2-story (Special plan)	20.80×13.00 21.80×14.00	3,633.2	24,072.23
Tarlac	Tarlac	2	Concrete and wood with G. I. roof (Doctors' cottage)	2–7.00× 9.00	403.0	8.391.50
Do.	do	1	Concrete with G. I. roof (court house), 2-story	27.90×29.60	816.3	39,334.64

PORT WORK AND MAINTENANCE

Good progress was made on estero dredging with the consequent benefit to traffic on those waterways. The Inner Basin was cleaned out for the first time for a number of years and a small adobe ledge in the Pasig River near San Pedro Makati was removed.

The steamship *Drcdger* was repaired at Engineer Island and new suction pipes installed. The pumps were overhauled and new "Ys" provided for the discharge lines. Needless to say, the steamship Dredger has not improved with another year of service and definite steps should be taken promptly to secure a larger and more economical unit to replace it. A dredge of essentially the same type should be acquired, since it is certain that dredging for maintenance will always be necessary in Manila.

Dredge No. 4 returned from Iloilo in June and was assigned to dredge the Oil Dock berth and the Inner Basin. Work was started in the latter part of the year reclaiming a foreshore area at Manila leased by the Manila Railroad Company.

Work was started by the Atlantic Gulf & Pacific Company on May 22, 1926, on the new South Breakwater and by the end of the year a total of 76,599.10 cubic meters had been placed. The breakwater consists of derrick-size rock and extends out from Fort San Antonio Abad, Malate, to the West Breakwater, where it is planned to provide a new entrance for ships and then close the present entrance.

Repairs were made to the marginal wharves of the Cargo Shed located between Piers 3 and 5, and at the Muelle del Banco Nacional.

General repairs were also made at Sisiman Matadero and a small temporary shelter constructed at Fort Wm. McKinley for world-longitude observers of the Coast and Geodetic Survey.

The dredging work accomplished during the year is indicated in the following tabulation:

Location	Total, 1902 to 1925	Total for 1926	Steamer Dredger	Dredges							Total
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	
	Cu. meters	*Cu. meters*									*Cu. meters*
Lower Pasig River	7,761,030	231,500	7,500	224,000							7,992,530
Outer Harbor	4,283,768	937,662	893,000				44,662				5,221,430
Upper Pasig River	1,029,576	910						910			1,030,486
Inner Basin	530,179	69,034					69,034				599,213
Binondo Estero	78,831	445						445			79,276
Estero de la Reyna	275,528	15,300						8,303	6,997		290,828
Paco Estero	38,109	7,080							7,080		45,189
San Miguel Estero	60,842										60,842
Provisor Estero	31,681										31,681
Marine Railway Engineer Island	45,407										45,407
Talim Island (City)	1,071										1,071
Outer Bar	1,406,514	96,840		96,840							1,503,354
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580										16,580
Engineer Island Canal	37,540										37,540
Vitas Estero	477,881	62,484				62,484					540,365
Quiapo Estero	12,507										12,507
Segado Estero	35,509										35,509
Pandacan Estero	178										172
San Lazaro Estero	22,975										22,975
Corregidor Harbor (Quartermaster)	54,956	8,790								8,790	63,746
Iloilo River	2,763,826	200,806					200,806				2,964,632
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	28,920	1,235						1,235			30,155
District of Cavite	20,876										20,876
Tondo Beach	16,203	86,190				3,679	82,511				102,393
Santibanez Estero	24,216										24,216
Tanque Estero	28,057										28,057
Tacloban Wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato River	49,462										49,462
Earnshaws Slipways	55,113										55,113
Los Baños Pier	11,160										11,160
United state Navy, Cavite	854,160	92,000	92,000								946,160
Concordia Estero	10,047	5,368						5,368			15,415
Malabon Canal	36,821										36,821
Port Libas, Capiz	31,413										31,413
Napindan Bar	100,856										100,856
Polo Club		12,471				9,961	2,510				12,471
Totals	20,867,917	1,828,115	992,500	320,840		76,124	399,523	16,261	14,077	8,790	22,696,032

DESIGNING DIVISION

Walter J. Grodske, *Chief Designing Engineer*

The year just closed has been a particularly active one for the Designing Division, caused by the numerous proposed public works projects to be financed by bond issues during the coming year. The continued shortage of experienced and trained designing engineers, the absence of the supervising engineer of the Port Works Section for a considerable portion of the year and the resignation of the supervising mechanical engineer were serious handicaps to this division. The unusual demand for preliminary studies, plans and estimates for bridges and port works somewhat restricted the division in turning out completed plans and specification for structures for which funds were available, but nevertheless a large number of such plans were executed.

The quality of concrete incorporated in structures built for the Government continued at a very high average due to insistence upon the compliance with specifications in the matter of maintaining the specified compressive strength for concrete. The total number of tests on concrete materials has continued to increase over the year preceding as noted in the following table:

	1925	1926	Increase
			Per cent
Total tests on cement 1/10 barrels tested	5,259	6,880	31
Total tests on concrete	3,649	3,766	3
Total tests on sand	63	66	5
Total terts on gravel	48	34	

Investigation of 686 foreshore lease and land sales applications were made for the Bureau of Lands, a slight increase over the number made during the year 1925.

Plans, specifications and estimates for projects covering bridges, port works, wiring of public buildings for electric lighting, pumping and power plants and other structures, as well as the more important activities of this division in the field, covering investigations, inspections, surveys, operation of cement gun, sand blasts and calyx core drill outfits, installations and construction are listed in Tables A, B, C, D, E, F, G, H, I, and J. Numerous and varied miscellaneous time consuming studies, technical consultations, preparation and correction of civil service examinations for civil, electrical and mechanical engineers and miscellaneous investigations and reports, in addition to those listed in the tables, were made by the personnel of the various sections of this division throughout the year.

Five field outfits of calyx core drills with trained men in charge continued to be operated on the investigation of subsoil conditions for bridges, wharves and other projects throughout the Islands. The method of shipping boring samples to the main office in tin cans has been improved whereby the samples will maintain their moisture content for considerable periods of time and whereby the data accompanying the samples is maintained in legible form.

A revised draft of the motor vehicle law was prepared, the adoption of which would clear up ambiguous clauses and facilitate reference to the Act.

Improvements have continued at the Insular Quarry at Los Baños covering the machinery layout at the bins, electric drive for crushers, revolving screens and tram car hoists. Bids for the hydro-electric equipment were received and the contract awarded, and this equipment is expected to be installed early in 1927.

Provincial and municipal authorities are now providing funds for electric plants for both power and lighting, and the work of the Electrical Section has been considerably increased thereby.

In addition to the smaller plants and the wiring of provincial buildings, considerable attention was given to the matter of appropriate lighting fixtures for the new Legislative Building in Manila. Contracts have been let for the lighting fixtures and with few exceptions they have already been installed. An automatic pump with pressure tanks has likewise been installed in the basement of this building so as to maintain adequate water pressure on the upper floors. Detailed specifications were also prepared for the proposed electric elevators, and proposals have already been received in response to advertisement. These elevators will be installed early in 1927.

Activities in port work construction has continued to increase and the work accomplished on the more important projects follows:

Tagbilaran, Bohol.—A reinforced concrete pile wharf 18 meters in length by 9.40 meters in width is planned for this port. The 28 piles for the wharf were cast by administration and the driving thereof and the erection of the superstructure will be undertaken during the coming year.

Aparri, Cagayan.—At the port of Aparri, Cagayan, 325 linear meters of reinforced concrete seawall with concrete apron were constructed under contract by Mr. Fortunato Concepcion on a unit price basis which amounts to approximately ₱233 per linear meter of seawall. A total of 600 linear meters of seawall has now been constructed as a protection to the town from encroachment by the sea.

Capiz, Capiz.—Considerable difficulty has been experienced in getting the work on the rock breakwater at the port of Capiz under way. The project was advertised and bids were opened on January 30, 1926 but no proposals were received. With the very limited equipment available, approximately 9,000 metric tons of rock were placed by administration in the South Breakwater. The project is again being advertised with the opening of bids scheduled for January 15, 1927.

Dalahican, Cavite.—The work of extending and raising the Dalahican breakwater to an elevation of 2.50 meters above mean lower low water (M. L. L. W.) was undertaken in December, 1925 and continued until May, 1926 when weather conditions made it necessary to stop the work. The rock was deposited in place in the breakwater by the Atlantic, Gulf & Pacific Company at a unit price of ₱3 per metric ton. A total of 30,089 metric tons of rock were placed during the year.

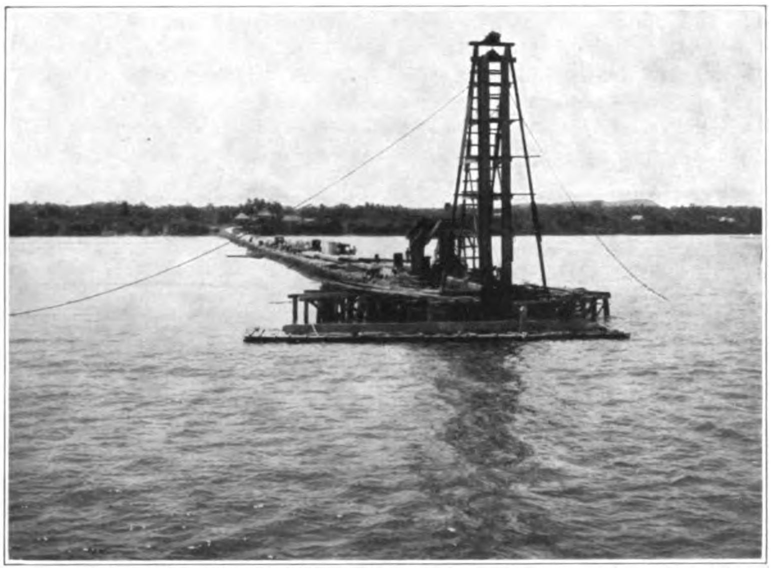
Cebu, Cebu.—A contract for the construction of approximately 140 linear meters of riprap jetty in the harbor of Cebu was awarded to R. R. Landon in February, 1925. The work progressed very slowly, and during the early part of 1926 was practically abandoned by the contractor. It finally became necessary to take over the work by administration and hold the contractor's bondsmen for the cost of completing the project. During the latter part of 1926, 2,537 metric tons of rock were placed in the jetty by administration.

The orange peel bucket dredge which was sent to Cebu in 1925 has been utilized during the greater part of 1926 in dredging along the Cebu waterfront. During the year 22,740 cubic meters of materials were removed and placed in the Cebu reclamation area.

Santa Ana, Davao.—Bids were opened on January 30, 1926 for the construction of a reinforced concrete wharf at Santa Ana, Davao. On March 25, 1926 a contract was awarded to C. V. Powers for the construction of the approach section, 49 meters in length by 9.30 meters in width, for the sum of ₱66,700 and for the construction of 3 intermediate main wharf units 2.50 meters in length by 12.30 meters in width for the sum of ₱4,880 per unit. Considerable delay occurred in starting the work due to the necessity of repairing and strengthening the present wooden section of the wharf before starting the concrete construction. To date 36 piles have been cast, 15 of which have been driven. The project as originally contemplated when advertised comprised, in addition to the approach section, the construction of the main wharf or L-section 68 meters in length by 12.30 meters in width. Although the inclusion of sufficient funds to complete the wharf was recommended in the Budget, the Legislature failed to make any appropriation for the project and it will therefore be necessary to stop the work upon the completion of that portion covered by the original contract.

Iloilo, Iloilo.—Suction Dredge No. 4 which was sent to Iloilo in April, 1925 continued the work of dredging the bar and the lower reaches of the Iloilo River until June 5, 1926 when the dredge was returned to Manila. A total of 200,806 cubic meters of material was dredged during the year at a cost of ₱34,522.62 or at a unit cost of ₱0.172 per cubic meter.

Bids were opened for the construction of 115.2 linear meters of concrete river wall with timber pile foundation on May 25, 1926 and a contract was awarded on June 24, 1926 to George G. Martin of Iloilo for the sum of ₱987 per linear meter of wall, exclusive of fender piles and mooring bitts. On December 31, 1926, the contractor had completed 24 meters of wall and it is expected that the project will be entirely completed by the middle of the coming year. This construction when completed will close the existing gap in the river wall below the Iloilo customhouse.



Tagbilaran Wharf (under construction), Bohol Province

Bids were opened on May 15, 1926 for the construction of two riprap jetties at the mouth of the Iloilo River and a spur dike for the protection of the shore along the Iloilo south beach. A contract was awarded on July 28, 1926 to Messrs. George G. Martin, William Werry and Mark S. Conway for delivering in place in the jetties at the mouth of the Iloilo River 25,000 metric tons and in the spur dike 12,500 metric tons of derrick rock at a unit price of ₱3. To date no rock has been delivered but the contractors have opened a quarry on the island of Guimaras, constructed lighters, and collected equipment preparatory to starting the work.

Manila.—Two of the automatic electrically operated steel gang planks for Pier No. 7 were designed and erected by this division, and they have proven very satisfactory in following the varied and extreme movements of vessels berthed alongside the pier. Two additional gang planks to replace the temporary timber structures at present in use are practically completed and will be erected early in the coming year.

On June 30, 1926, the second half of Pier No. 7 was completed and turned over to the Bureau of Customs for operation, thereby bringing to completion one of the largest projects in the Islands. Small gangs were maintained on cement gun work and were occupied in shooting the gunite protection on the large steel girders connecting the pier proper with the shore abutment.

On April 13, 1926 bids were opened for the construction of aprons 7.75 meters in width around Pier No. 5, consisting of a heavy reinforced concrete deck designed for 600 pounds per square foot and supported on reinforced concrete piles identical in size with those used in Pier No. 7. However, as was expected, no bids were received and it was necessary to undertake the work by administration. Pile driving was commenced on May 29th and completed on August 23rd, and the reinforced concrete deck was finished and surfaced with creosoted block paving in October, 1926, under the same supervision that handled the Pier No. 7 project.

On March 6, 1926, bids were opened and the contract awarded to the Atlantic, Gulf & Pacific Company of Manila, the only bidder, for furnishing and delivering in place 200,000 metric tons of derrick rock in the 1,180 linear meters of South Breakwater at the unit price of ₱2.84 per metric ton. By the end of the year a total of 76,800 tons of rock had been placed.

The construction of a combination highway and railway bridge over the Pasig River connecting Calle Bonifacio and Calle del Pan was again taken up. The project was studied in detail and preliminary estimates were made for comparing various types of structures for this site. It is expected that the matter of financing this project will be considered early in 1927.

Pulupandan, Occidental Negros.—In accordance with the provisions of Act No. 3220, a contract in the amount of ₱720,000 was awarded to the Maao Sugar Central Company on January 26, 1926 for the development of the port of Pulupandan. The contract was later assigned by the Maao Sugar Central to the Atlantic, Gulf & Pacific Company, who are now carrying out construction work. The project includes the construction of a reinforced concrete pier extension to the present wooden pier of the Maao Sugar Central Company, the construction of 300 linear meters of creosoted timber seawall, 75 linear meters of riprap breakwater, the dredging of a refuge basin for small boats to a depth of 10 feet and the reclamation of 10,000 square meters of foreshore land. The concrete pier extension is to consist of the approach 7.90 meters in width and 67.70 meters long, the pier head connection varying in width from 7.90 meters to 21.75 meters and 45.20 meters long, and the main pier 21.75 meters wide and 151.50 meters long. The pier will be supported by 50 centimeters reinforced concrete piles. On December 31, 1926, a total of 143 piles had been cast, of which 77 have been driven.

Zamboanga, Zamboanga.—Work on the construction of the reinforced concrete wharf extension at Zamboanga, which was awarded under contract to Mr. Jose Gandiongco early in 1925, progressed so slowly that during the later part of 1925 in became necessary to annul the contract and take over the work by administration. The driving of the concrete piles was started by administration in January, 1926 and the project was entirely completed by the end of year. The work accomplished comprises the construction of 78 linear meters of reinforced concrete wharf 12.30 meters wide, supported by 50 centimeters reinforced concrete piles.

Maintenance.—In addition to port works construction, maintenance work was accomplished during the year at Loay, Bohol; Tacloban, Leyte; Cagayan, Misamis; Dumaguete and Larena, Oriental Negros; Catbalogan, Samar and Surigao, Surigao.

TABLE A.—*Bridges*

Province	River	Road	Type	Remarks
Albay	Bicol	Municipal	Suspension—54.9 m.	Plans and specifications.
Batangas	Manghinao	Bauan–Taal	R. C. arch—15.0 m.	Do.
Bohol	Guinacut	Tagbilaran-East	R. C. girders—14.0 m.	Do.
Do	Loboc	Bacani–Carmen	Steel truss—24.4 m.	Do.
Bukidnon	Malopale	Malaybalay–Mailag.	Suspension—36.6 m.	Do.
Bulacan	Sibul	San Miguel–Sibul.	Wing walls and apron.	Do.
Camarines Norte	Talisay	Talisay–Laboc	Steel truss—24.4 m.	Do.
Camarines Sur	Tabuco	Naga–Pasacao	Sidewalk added—50.2 m.	Do.
Cebu	Mananga	Cebu–Toledo	Suspension—61.0 m.	Do.
Davao	Davao	Davao–South	Steel Truss—183.0 m.	Preliminary plan and estimate.
Ilocos Norte	Bacarra	Manila–North	Steel truss—195.2 m.	Do.
Ilocos Sur	Abra	Manila–North	Cable ferry—330.0 m.	Revised plan.
Do	Butac	Tagudin–Cervantes.	Suspension—48.8 m.	Plans and specifications.
Do	Sinalang	Benguet–Tagudin.	Steel truss—48.8 m.	Do.
Laguna	Lumbang	San Pablo–Santa Maria.	Steel truss—118.8 m.	Do.
La Union	Aringay	Manila–North	Steel truss—366.0 m.	Preliminary plan and estimate
Do	Cadael	Agoo–Aringay	R. C. girders—20.2 m.	Plans and specifications.
Do	Cava	Cava–Aringay	R. C. girders—72.0 m.	Do.
Do	Naguilian	Bauang–Naguilian.	Steel truss—502.7 m.	Preliminary plan estimate.
Do	Nilanguyan	Camp 1–Aringay.	Suspension—36.6 m.	Plans.
Nueva Ecija	Binituan	Manila–North	Steel truss—62.8 m.	Preliminary plan and estimate.
Nueva Vizcaya	Magat	San Jose–Santa Fe.	Steel truss—16.1 m.	Plans and specification.
Nueva Ecija	Pampanga	Manila–North	Steel truss—594.7 m.	Preliminary plan and specification.
Occidental Negros	Hinigaran	Bacolod–South	R. C. girders—135.0 m.	Plans and specification.
Do	Ilog	Bacolod–South	Steel truss—115.6 m.	Do.
Do	Malogo	Bacolod–North	R. C. girders—104.0 m.	Do.
Do	Talacaan–Dacu	Bacolod–South	R. C. girders—126.0 m.	Do.
Pampanga	San Fernando	Manila–Tarlac	R. C. arch—22.0 m.	Do.
Pangasinan	Agno	Rosales–Binalonan.	Steel truss—634.4 m.	Do.
Do	Tambac	Pao–Lingayen	R. C. girders—12.0 m.	Do.

TABLE A.—*Bridges*—Continued

Province	River	Road	Type	Remarks
Rizal	Tinajeros	Manila–North	R. C. girders—58.2 m.	Plans and specifications.
Tarlac	Cutcut	Capaz–Bamban	Steel truss—48.8 m.	Preliminary plan and estimate.
Do	Parua	Bamban–Mabalacat.	Steel truss—118.8 m.	Do.
Do	Tarlac	Tarlac-Camiling	Steel truss—316.8 m.	Do.
Standard Plans			Steel truss—36.6 m.	Plans.
Do			R. C. floor-truss—36.6 m.	Do.
Do			Steel truss—42.7 m.	Do.
Do			R. C. floor-truss—42.7 m.	Do.
Do			Steel truss—45.7 m.	Do.
Do			R. C. floor-truss—45.7 m.	Do.

TABLE B.—*Port works*

Province	Port	Type of structure	Remarks
Batangas	Batangas	Concrete landing	Construction.
Bohol	Tagbilaran	R. C. pile wharf	Plans.
Cagayan	Aparri	Sea wall	Contract.
Capiz	Capiz	Breakwater	Plans and specifications.
Cavite	Manila–Cavite road	do	Contract.
Cebu	Cebu	Rock jetty	Construction.
Do	do	Reclamation	Dredging.
Do	do	R. C. wharf	Plans.
Davao	Santa Ana	do	Contract executed.
Iloilo	Iloilo River	Rock jetties	Do.
Do	do	Concrete wall	Plans, specifications and contract.
Manila	Manila Pier No. 7	Pier and pier head	Construction completed.
Do	do	Steel gang plank	Construction.
Do	Manila Pier No. 5	R. C. aprons	Plans, specifications and construction.
Do	Manila	South breakwater	Plans, specifications and contract.
Do	Pasig River bridge	Combination highway and railway.	Preliminary estimate
Occidental Negros	Pulupandan	Port developement and pier.	Contract and inspection.
Saluag	Saluag Island	Lighthouse tower	Plans and specification.
Tubbataha	Tubbataha Island	do	Do.
Zamboanga	Zamboanga	R. C. wharf extension.	Construction.

TABLE C.—*Wiring of buildings*

Province	Location	Type	Remarks
Albay	Albay	Provincial hospital	Plans and contract.
Batangas	Batangas	do	Do.
Do	do	Capitol building	Completed by contract.
Bohol	Tagbilaran	do	Completed by administration.
Capiz	Capiz	Capitol grounds	Plans.
Cebu	Cebu	Hospital–Rewiring	Plans and installation.
Do	do	Hospital dining building.	Plans and contract.
Ilocos Norte	Laoag	Capitol annex	Preliminary estimate.
Jolo	Jolo	Pier lighting	Completed by administration.
Laguna	Santa Cruz	Hospital administration building.	Plans and contract.
Do	do	Hospital kitchen building.	Do.
Manila	Manila	P. G. H. Guazon Memorial.	Completed by contract.
Do	do	P. N. S. training school building.	Plans and contract.
Do	do	U. P. medical school annex.	Preliminary estimate.
Do	do	P. N. S. addition	Do.
Nueva Ecija	Cabanatuan	Provincial High School.	Plans and installation.
Do	do	C. L. A. S. dormitory.	Do.
Occidental Negros	Pulupandan	Pier lighting	Included in contract.
Pampanga	Mabalacat	20–Rm. standard school.	Plans and specifications
Pangasinan	Dagupan	Hospital ward pavilion.	Plans and installation.
Do	do	Presidencia	Plans and contract.
Do	Lingayen	High School (2 Bldgs.)	Do.
Do	Bayambang	Normal School academic building.	Do.
Do	do	N. S. Training building.	Do.
Rizal	San Felipe Neri	Insular Asylum	Plans and specifications.
Do	do	Orphanage School	Completed by contract.
Tarlac	Tarlac, Tarlac	Provincial prison addition.	Plans and specifications.
Tayabas	Lucena	Hospital kitchen building.	Plans and installation.
Do	do	Hospital ward pavilion.	Plans and contract.
Do	do	Capitol grounds	Plans.

TABLE D.—*Oil engine driven electric system*

Province	Location	Type	Remarks
Albay	Albay	Hospital lighting	Plans and specifications.
Batangas	Batangas	Capitol and hospital lighting.	Revised plans.
Do	do	Fuel oil tank	Plans and specifications.
Do	Bauan	Lighting	Plans and contract.
Do	Taal	Fuel oil tank	Plans and specifications.
Bohol	Tagbilaran	Engine cooling system.	Plans.
Do	Dauis	Line extension	Do.
Camarines Norte	Calabanga	Street lighting	Plans and specifications.
Cebu	Argao	Lighting	Plans and specifications.
Nueva Ecija	Cabanatuan	C. L. A. S. light and power.	Continued installation.
Pangasinan	Dagupan	Hospital light and power.	Inspection.
Do	Lingayen	Addition to sytem	Contract and tests.

TABLE E.—*Hydro-electric plants*

Province	Location	Type	Remarks
Ilocos Sur	Amburayan	Power and lighting	Preliminary study.
Laguna	Nagcarlan	Power development	Do.
Mountain Province.	Baguio	Waterwheel installation.	Inspection.
Do	Bontoc	Power development	Preliminary study.
Nueva Ecija	Peñaranda	do	Preliminary suggestions.

TABLE F.—*Pumping plants*

Province	Location	Type	Remarks
Batangas	Batangas	Deep well pump	Specification and selection.
Do	Bauan	Fire set and auxiliary oil engine.	Specification and contract
Bulacan	Malolos	Waterworks larger pump.	Specification.
Cavite	Cavite	Waterworks 2nd set	Specification and installation.
Do	do	Fire set	Specification and contract.
Do	Indang	Waterworks spring house.	Revised plans
Capiz	Capiz	Pump for presidencia.	Specification.
Laguna	Calamba	Waterworks	Installation.
Do	Santa Cruz	Waterworks fuel tank.	Plans and specifications.
Manila	Manila	Santol T. C. pump etc.	Investigation and study.
Do	do	Legislative Building automatic pump.	Plans and contract
Nueva Ecija	Cabanatuan	Septic vault pump	Specification.
Pangasinan	Lingayen	Fire set	Specification and contract
Do	do	Waterworks	Plans, tests and repairs.
Zamboanga	Zamboanga	Radio station water supply.	Study and recommendations.

TABLE G.—*Calyx core drilling*

Province	Location	Type	Remarks
Abra	Sinalang River	Bridge	Borings completed.
Batangas	Hagonoy River	do	Do.
Do	Lagnas River	do	Do.
Bohol	Alihawan River	do	Do.
Do	Manaba River	do	Do.
Cebu	Cebu	Wharf	Do.
Davao	Santa Ana	do	Do.
Iloilo	Iloilo River	Wall	Do.
Do	Tiolas River	Bridge	Do.
Do	Dingle	Waterworks	Do.
Do	Iloilo	do	Do.
Laguna	Magampon River	Bridge	Do.
La Union	Cava River	do	Do.
Occidental Negros	Calatraba River	do	Do.
Do	Danao River	do	Do.
Do.	Hinigaran River	do	Do.
Do	Ilog River	do	Do.
Do	Malogo River	do	Do.
Do	Suay River	do	Do.
Tarlac	Cut-Cut River	do	Do.
Do	Parua River	do	Do.
Do	Tarlac River	Dam	Do.
Zambales	Bancal River	Bridge	Do.
Do	Cabangan River	do	Do.
Do	Salasa River	do	Do.

TABLE H.—*Cement gun and sand blasting*

Province	Location	Type	Remarks
Cebu	Various jobs	Repairs	Cement gun.
Iloilo	Iloilo	Waterworks	Compressor outfit.
Leyte	Various bridges	Cleaning and painting.	Sand blasting.
Manila	Pier No. 3	Repairs	Cement gun.
Do	Pier No. 5	Construction	Do.
Do	Pier No. 7	do	Do.
Do		Repairs and overhauling.	Cement gun and compressors.

TABLE I.—*Mechanical*

Province	Location	Type	Remarks
Bulacan	Angat	Gate lifting device	Plans.
Ilocos Sur	Abra Ferry	Mechanical details	Plans and tests.
Laguna	Los Baños Quarry	New crusher layout	Plans and installation.
Do	do	Water wheel	Plans and contract.
Manila	Manila	Water barge, 6,500 gallons.	Plans and specifications.
Do	Pier No. 5	Oil and water lines	Installation.
Do	Pier No. 7	Electrically operated gang planks.	Plans and installation.
Do	Legislative Building	Electric elevators	Plans and specifications.
Mountain Province	Baguio Ice Plant	Steam and ammonia condensers.	Specifications.
Standard		Explosive magazine	Plans and specifications.

TABLE J.—*Investigations and reports*

Province	Location	Type	Remarks
Cagayan	Aparri	River jetties	Investigation and survey
Cavite	Binacayan	Repairs to timber bridge.	Investigation and report.
Do	Bacoor	Boiler explosion	Do.
Cebu	Cebu Cement Plant	Mechanical conditions.	Inspection and report.
Ilocos Norte	Laoag–Vintar	Dam failure	Investigation and report.
Laguna	Nagcarlan	Proposed electrical system.	Investigation.
Manila	Manila	Various cars	Tests and reports.
Do	Carnival	Royal clock contest	Technical report.
Do	Pier No. 7	Cargo handling machinery.	Service report.
Do	Bureau of Posts	Radio plants bids	Study and recommendations.
Do	Carmi A. Thompson	Public works development.	Economic report.

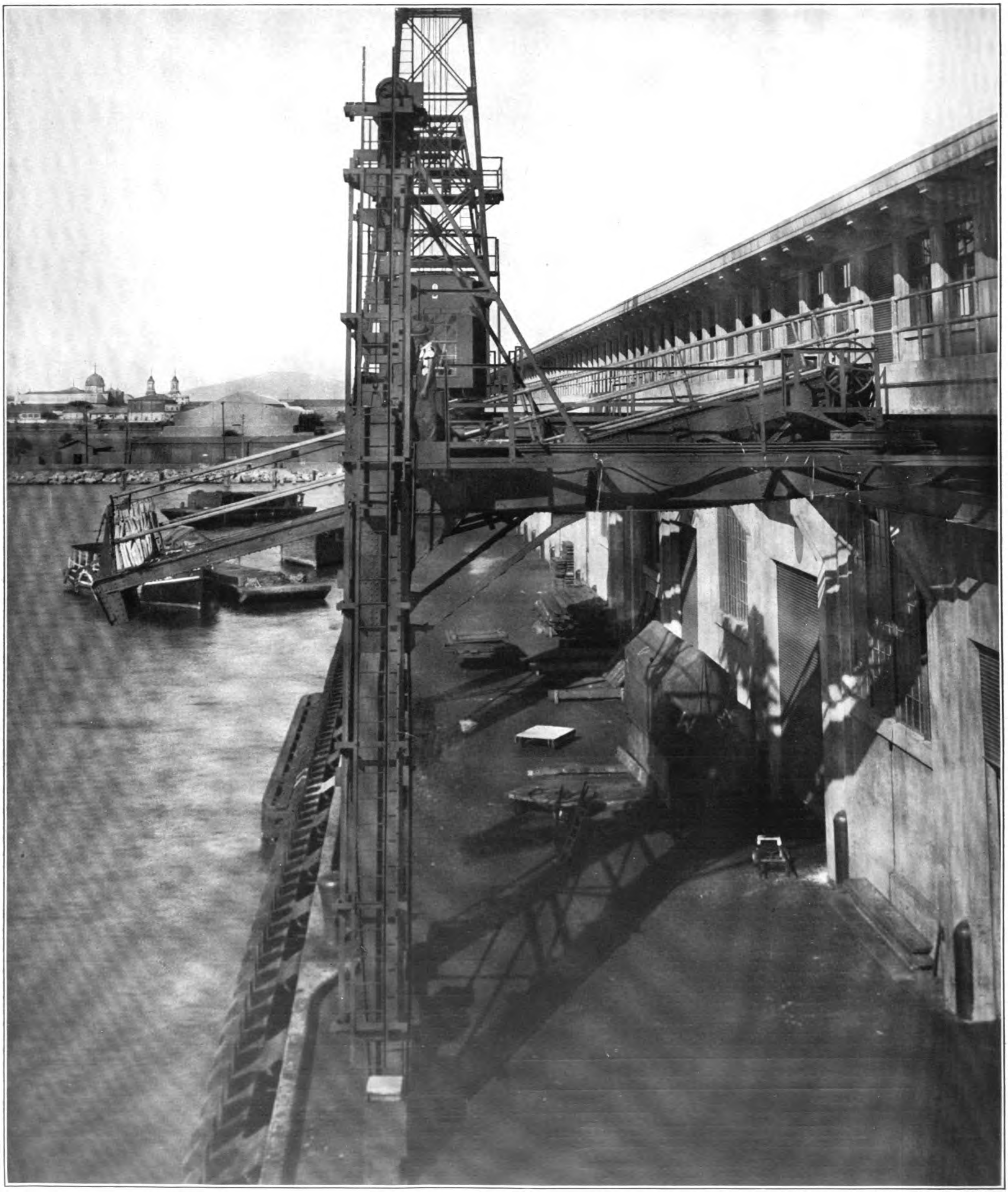
DIVISION OF ARCHITECTURE

CHERI MANDELBAUM, *Acting Chief of Division*

The work of this division was very greatly increased during the past year on account of provincial and municipal appropriations, loans and bond issues authorized for building work including several provincial capitols. There has also been a considerable demand on the part of provincial and municipal officials for town development and landscape plans. Insular funds provided for the acquisition of the site and preliminary work for the construction of a modern Psycopathic Hospital necessitated the preparation of complete development plans for this institution, and plans that contemplate carrying on construction work over a period of five years and an investment of over ₱1,000,000 in buildings. The revision of the preliminary plans for the Manila Post Office Building was undertaken with a view to undertaking construction in 1927. Plans were completed for the Training School of the Philippine Normal School. Studies were made and drawings prepared for numerous other projects, the status of which are given in the following tabulations of projects assigned to Messrs. Mapua and Arellano, supervising architects, as well as to Mr. Toledo, acting supervising architect (during the absence of Mr. Arellano).

Projects assigned to Mr. Mapua showing status of each

Manila projects	Status
1. Training school	Preliminary and working drawings completed.
2. Pier No. 7	Full size details prepared.
3. Normal hall	Preliminary plans for two-story addition prepared. Working drawings are nearing completion.
PROVINCIAL PROJECTS	
1. Standard provincial hospital (20-bed capacity)	Full size details completed.
2. Employees quarters of radio station	Plans for kitchen completed.
3. Pili Presidencia, Camarines Sur	Location plan prepared.
4. Davao Municipal Building, Davao	Plans for an addition completed.
5. Southern Island Hospital, Cebu	Preliminary and working drawings completed.
6. Standard School Plan No. 10–A	Full size details prepared.
7. Bayombong Provincial Building, Nueva Vizcaya	Working drawings revised.
8. Mabalacat Presidencia, Pampanga	Plans for second story addition completed.
9. Carmen Presidencia, Cebu	Location plan and full size details prepared.
10. Cabanatuan High School, Nueva Ecija	Plans for completion prepared.



ELECTRICALLY OPERATED AUTOMATICALLY ADJUSTING GANG PLANK ON PIER No. 7, MANILA

Projects assigned to Mr. Mapua showing status of each—Ctd.

Provincial projects	Status
11. San Fernando Waterworks, La Union	Prepared drawing for the bronze tablet.
12. Macalelon Waterworks, Tayabas	Do.
13. Guimbal Municipal Building, Iloilo	Do.
14. Muñoz Agricultural School, Nueva Ecija	Plans for the alteration of granary completed.
15. Compostela Presidencia, Cebu	Location plan prepared.
16. Nurses Home, Tarlac	Preliminary plans revised and checked structurally.
17. La Castellana Presidencia, Occidental Negros	Prepared drawing for the bronze tablet.
18. Santa Ignacia Presidencia, Tarlac	Location plan prepared.
19. Dagupan Presidencia, Pangasinan	Do.
20. Alcala Presidencia, Cagayan	Do.
21. Albay Hospital, Albay	Full size details prepared.
22. Tarlac Court House, Tarlac	Working drawings completed.
23. Insular Asylum, San Felipe Neri, Rizal	Preliminary plans for the several buildings of this project prepared. Working drawings for the receiving wards completed, and working drawings for the administrative building are nearing completion.
24. Standard provincial hospital (30-50-bed-capacity)	Full size details prepared.
25. Provincial post offices, Schemes A and B	Working drawings completed.
26. Batangas Hospital, Batangas	Location plan prepared.
27. Pangasinan High School, Pangasinan	Preliminary and location plans prepared.
28. Nabua Presidencia, Camarines Sur	Location Plan prepared.
29. Lopez Presidencia, Tayabas	Prepared drawing for the bronze tablet.
30. Laoag Capitol Building, Ilocos Norte	Preliminary plans for the annex prepared and working drawings are in the course of preparation.
31. Court House, Laguna	Working drawings revised.
32. Bayambang Normal School, Pangasinan	Location plan prepared.
33. Zamboanga General Hospital, Zamboanga	Plumbing plan of Nurses Dormitory prepared.
34. Bani Presidencia, Pangasinan	Location plan prepared.
35. Davao Hospital, Davao	Working drawings for the contagious pavilion completed. Preliminary plans for the administration pavilion nearing completion.
36. Bula Presidencia, Camarines Sur	Location plan prepared.
37. Mogpog Presidencia, Marinduque	Do.
38. Nurses' Quarters, Laguna	Working drawings prepared.
39. Villasis Presidencia, Pangasinan	Location plan prepared.
40. San Fabian Presidencia, Pangasinan	Do.
41. Castellana Market, Occidental Negros	Do.
42. Biñang Municipal Cemetery, Laguna	Layout prepared.
43. Martires de Nueva Ecija, Monument	Working drawings completed.
44. Teachers' Camp, Baguio	Working drawings for the Social Hall completed.
45. Automobile Shed, Baguio	Working drawings completed.
46. Cagsawa Park, Camarines Sur	Layout prepared.
47. Kabankalan Market, Occidental Negros	Location plan prepared.
48. High School Assembly Hall, Pangasinan	Preliminary plans in preparation.
49. Cotabato Provincial Building	Working drawings completed.
50. San Juan Presidencia, La Union	Working drawings in preparation.
51. Bolbok Presidencia, Batangas	Do.
52. Cebu Capitol Building, Cebu	Preliminary plans in preparation.

Projects assigned to Mr. Arellano showing status of each

Manila projects	Status
1. The Post Office	
2. Library of the University of the Philippines	
3. Producers warehouse	Completed.
4. Monument to A. M. Regidor, Tondo	Do.
5. Harrison Park	Do.
6. Street layout property of La Compañia	Do.
7. Street layout, Plaza Goiti	Do.
8. Entrance to private properties of Dewey Boulevard	Do.
PROVINCIAL PROJECTS	
1. The Provincial Government of Bacolod, Occidental Negros.	
2. The Bacolod High School, Occidental Negros	
3. Calabanga town layout, Camarines Sur	Completed.
4. La Paz Plaza, La Paz, Iloilo	Do.
5. Flag pole, Baguio Teachers' Camp, Baguio	Pending waiting for more information.
6. Pagsanjan School (tandard two-story type), Laguna	Completed.
7. Tabaco town layout of Albay	Do.
8. Town layout of Cagayan, Misamis	Do.
9. Laoag Elementary School site, Ilocos Norte	Do.
10. Silay Fountain, Occidental Negros	Do.
11. Iriga Rizal Monument, Camarines Sur	Do.
12. Roxas Bridge bronze tablet, Capiz	Do.
13. Pasay development plan, Rizal	Do.
14. Rizal Monument, Bacolod, Occidental Negros	Do.
15. Development for the City of Iloilo and vicinity, Iloilo.	Do.
16. Development plan of Pasonanka Park, Zamboanga	Being checked.
17. Development of town of Davao, Davao	Completed.
18. Revised item municipal building, Aparri, Cagayan	Do.

Projects assigned to Mr. Toledo showing status of each

Manila projects	Status
1. The Post Office	Working drawings completed but now undergoing revision because of change in original plans.
2. Library of the University of the Philippines	Preliminary plans completed and approved by the Board of Regents of the University.
3. Magallanes Drive Layout	Completed.
4. Burham Monument Alteration and repairs	Do.
PROVINCIAL PROJECTS	
1. The provincial Government Building of Occidental Negros, Bacolod.	Working drawings being checked and specifications prepared.
2. The Bacolod High School, Occidental Negros	Working drawings 80 per cent completed.
5. Mambucal Spring Bath, Occidental Negros	Preliminary plans completed and working drawings in preparation.
4. Bronze Tablet, Dauin Waterworks, Oriental Negros.	Completed.

IRRIGATION DIVISION

A. D. WILLIAMS, *Chief Irrigation Engineer*

IRRIGATION PROJECTS

There were four irrigation projects completed during 1926, three under construction, thirteen completed prior to 1926 in operation, and sixty-four under consideration.

Of the completed irrigation systems, thirteen were insular, two municipal, and two special, located in twelve provinces. The aggregate area served by these systems is 61,045 hectares and the total cost was ₱11,443,625.99, the average cost per hectare being ₱187.46. Of the total amount invested thus far in the construction of completed projects, ₱7,092,518.99 were allotted from the ₱20,000,000 bond funds authorized by Acts 2940 and 3011: ₱4,408,607 from Insular appropriations: and ₱12,500 from municipal funds.

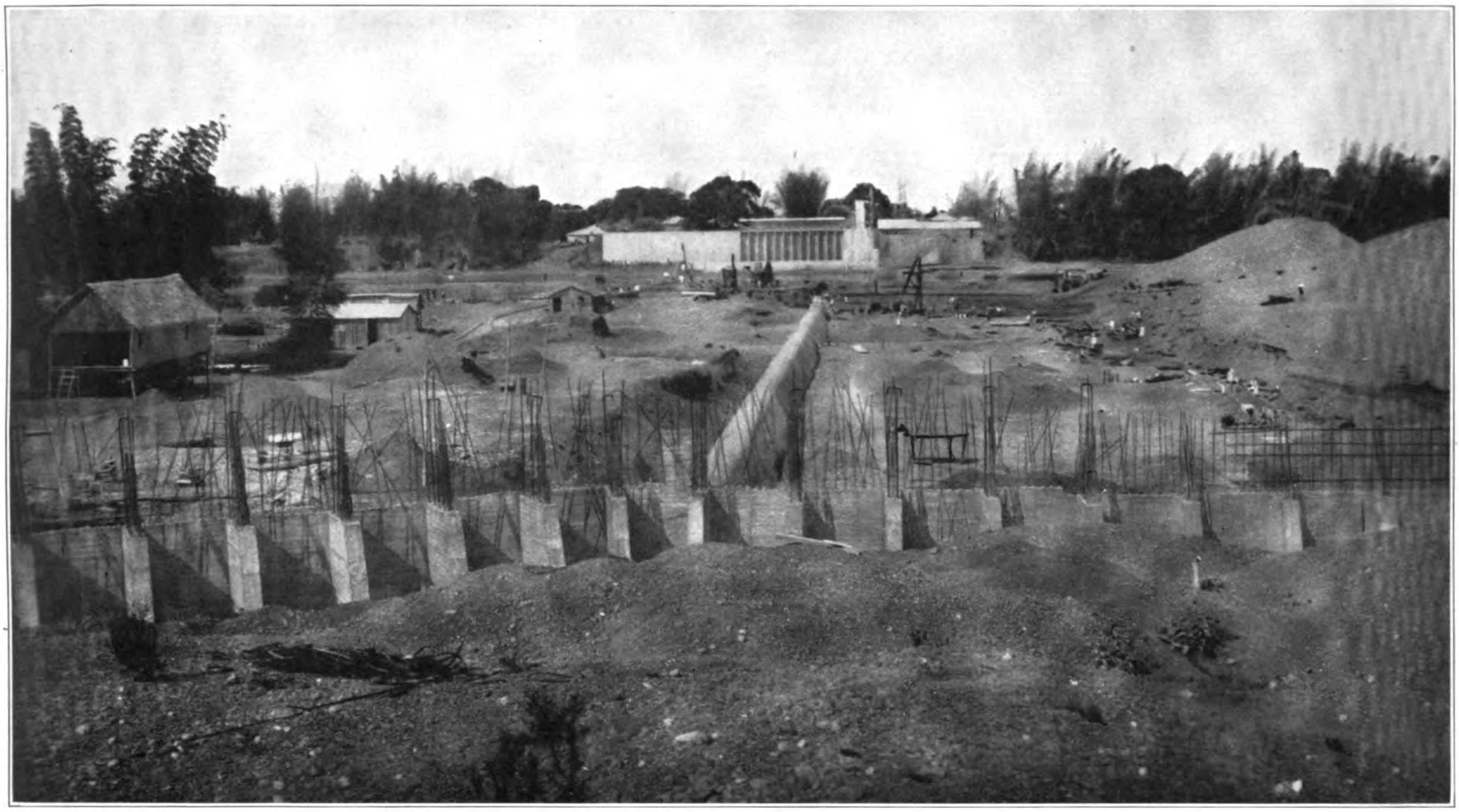
A table giving pertinent data on the irrigation projects completed and under way followed by a brief description of the work accomplished during the year, is given hereunder:

Table showing Government irrigation systems completed and under way

COMPLETED PRIOR TO 1926

Name of system	Classification	Province	Date of official opening	Irrigated area	Cost of construction	Cost per hectare	Annual irrigation charges per hectare	Number of years to pay	Population of municipalities affected (1918 census)
				Hectares					
1. Aganao River Irrigation system	Insular	Iloilo	Sept 1, 1924	5,995	₱917,000.00	₱152.96	₱11.66	40	70.389
2. Baruyen River irrigation system	do	Ilocos Norte	July 15, 1923	551	89,000.00	161.52	8.72	40	2.389
3. Dingras irrigation system	do	do	Jan. 1, 1923	1,014	130,000.00	128.20	10.21	40	21,388
4. Dipolog irrigation system	do	Zamboanga	Nov. 1, 1925	1,000	76,750.00	76.75	9.52	20	15,982
5. Naic irrigation system	do	Cavite	Jan. 7, 1923	676	292,000.00	431.95	22.26	40	9,794
6. Pilar irrigation system	do	Bataan	Sept. 1, 1916	170	27,607.00	162.39	14.94	40	4,064
7. Sta. Barbara irrigation system	do	Iloilo	Dec. 1, 1922	4,849	692,000.00	142.70	10.21	40	53.039
8. Tagudin irrigation system	do	Ilocos Sur	July 15, 1925	1,089	375,000.00	335.16	20.81	40	11,237
9. Talavera River irrigation system	do	Nueva Ecija	Nov.15, 1923	[a] 6,718 [b] 1,169	1,080,000.00	146.84	9.20 2.50	40	26,925
10. Santa Maria Irrigation system	Municipal	Zamboanga	Feb. 1924	431	23,000.00	53.39	2.00	(d)	30,798
11. Ayala irrigation system	do	do	Feb. 1924	183	17,000.00	92.89	2.00		30,798
12. Trinidad irrigation system	Special	Mountain Province	Jan. 1921	200	40,000.00	200.00			503
13. San Miguel irrigation system	do	Tarlac	Aug. 1913	4,000	789,000.00	197.25	(c)	(e)	3,564
Total				28,045	6,348,357.00				280,870

[a] New. [b] Old. [c] Total ₱29,000. [d] Indefinite. [e] Yearly.



PEÑARANDA RIVER DIVERSION WORKS UNDER CONSTRUCTION, NUEVA ECIJA PROVINCE
(View Looking along the axis of Dam from the North Abutment towards the Headgate Structure)

COMPLETED DURING 1926

1. Angat River irrigation system	Insular	Bulacan	July 1, 1926 May 1, 1926	8,000 13,000	4,818,768.99	229.47	15.11	40	136,125
2. Amburayan River irrigation system	do	La Union	June 1, 1926	4,000	1,156,000.00	289.00	18.29	40	35,741
3. O'Donnell River irrigation system	do	Tarlac	July 1, 1926	4,500	650,000.00	144.44	20.24	20	25,120
4. Sibalom-San Jose irrigation system	do	Antique	July 1, 1926	3,500	390,000.00	111.42	12.92	20	38,625
Total				33,000	7,014,768.99				235,611

UNDER CONSTRUCTION

Name of system	Classification	Province	Date of beginning construction	Irrigable area	Estimated cost	Allotments made	Percentage of work done	Remarks
							Per cent	
1. Peñaranda River irrigation system	Insular	Nueva Ecija	Jan. 1924	18,000	₱3,300,000	₱1,409.185	23	To be completed June 1928.
2. Laoag-Vintar irrigation system	do	Ilocos Norte	Jan. 1923	6,200	2,346,000	1,670,000	75	To be completed June 1927.
3. Extension Talavera R. irrigation system	do	Nueva Ecija	April 1926	1,500	120,000	110,000	40	Do.
Total				25,700	5,766.000	3,189,185		

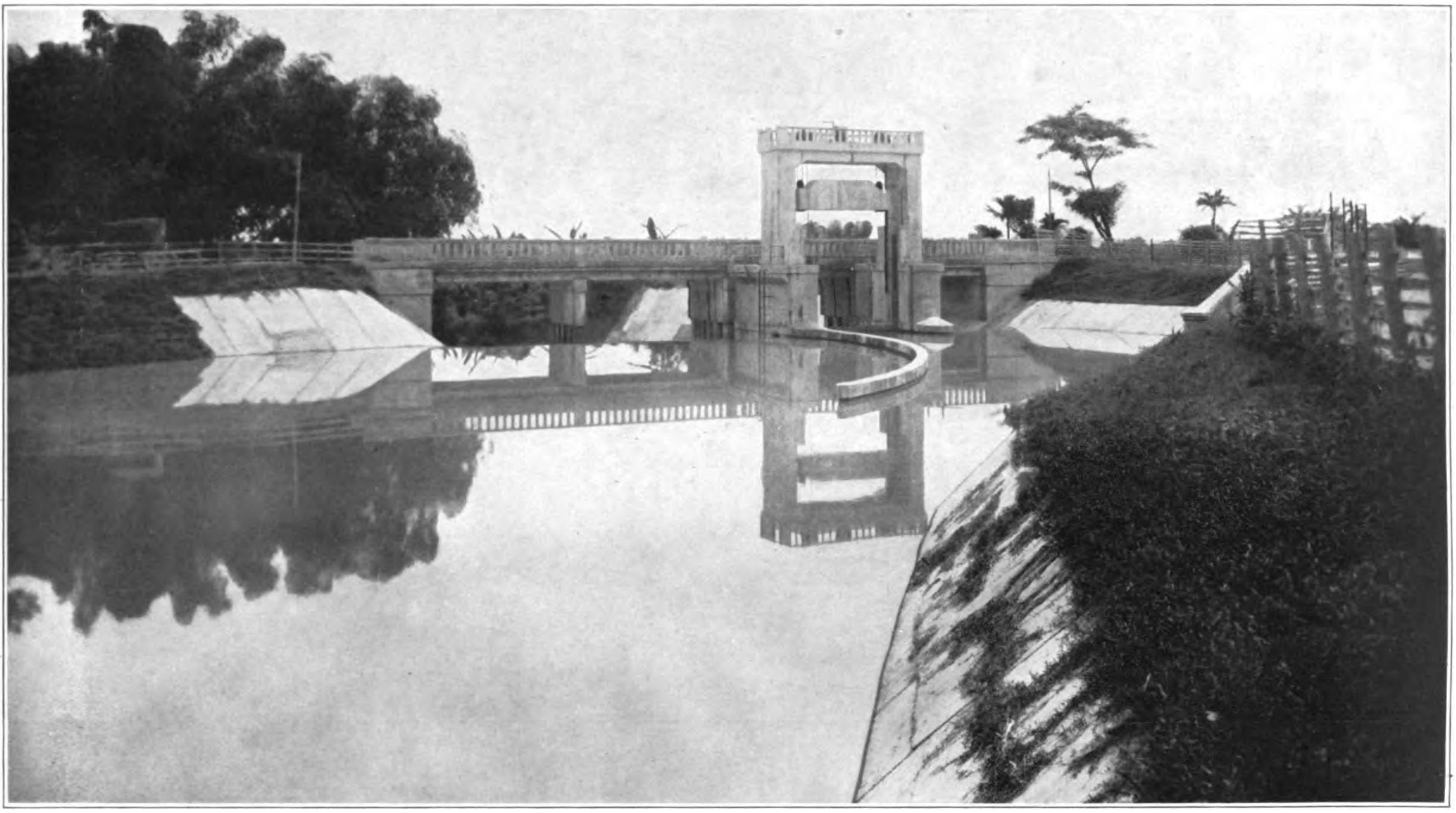
PROJECTS COMPLETED DURING 1926

The Angat River, Amburayan River, O'Donnell River, and Sibalom-San Jose Irrigation Systems were completed during the past year at a total cost of ₱6,964,768.99 and operated for the first time during the last growing season, serving an aggregate area of 33,000 hectares. This is the largest area placed under irrigation in any one year, since the inception of the Government irrigation construction program.

Angat River Irrigation System.—This system consists of the north side and south side units.

The construction of south side canal structures under contract with Mr. Romarico Agcaoili was completed on April 30, 1926. The construction of the extension of the south protection dyke damaged by the flood of June 25, 1925 was completed on December 10, 1926, under contract with Mr. Carlos A. Barretto. The telephone system and superintendent's office and quarters were also completed during this year. The south side unit was officially opened on May 1, 1926. It irrigated during the last growing season approximately 10,000 hectares of land, from which an increase in yield of about 50 per cent was obtained.

The construction of the main canal and important laterals of the north side unit under contract with Mr. Carlos A. Barretto was completed on June 28, 1926. The contract with Messrs. Gordon and Haley for the construction of canal structures was terminated on



Wasteway, North Main Canal, Angat River Irrigation System, Bulacan Province

December 6, 1926. Minor sublaterals remain to be excavated, and lateral structures, mostly turnouts, to be built. The north side unit was officially opened on July 1, 1925 and irrigated during the last growing season a total area of approximately 8,000 hectares. The project engineer reported general satisfaction with the results obtained during the first year of operation, and requests for extension have been received from many landowners. An extension of cover approximately 3,600 hectares of land and the construction of a protective dyke along the north bank of Angat River are now contemplated. The work involved is estimated to cost ₱380,000.

Amburayan River Irrigation System.—The lining of the 60-meter section of the tunnel near the outlet portal, the only portion of the system left to be finished at the end of 1925 was completed in March, 1926. The system began delivering water during the month of April, although it was not officially opened until June 1, 1926. The flood waters of San Cristobal, Tabug, Sinapangan, Talifugo, Maluyo, Obog, and Pagbennecan Creeks presented rather serious drainage and river control problems. Steps have already been taken towards the solution of these problems by channel diversion and improvement. An increase in yield of over 70 per cent was obtained from the 4,000 hectares of land irrigated during the last growing season. An extension of the Amburayan Irrigation System estimated to cost ₱260,000 to serve lands above the existing main canal and the lands located in the Darigayos Valley is now contemplated.

O'Donnell River Irrigation System.—The excavation of the main canal and laterals and the construction of the protection dyke under contract with Mr. Sotero Baluyut, contractor of San Fernando, Pampanga, was completed on September 6, 1926. The contract for the construction of canal structures also with Mr. Sotero Baluyut was completed on November 28, 1926. The system was officially opened on July 1, 1926, but actual water deliveries were made towards the end of August. Many landowners, refrained from using water from the system because they considered the annual arrigation charges of ₱20.24 too high. Of the total irrigable area, 2,655 hectares were planted to rice, 1,048.2 hectares to sugar cane, and 495.4 hectares were uncultivated. The condition of the rice crop was good, but accurate data on production has not been received.

Sibalom–San Jose Irrigation System.—The excavation of the main canal and laterals under contract with Mr. A. G. Yankey was completed on March 31, 1926, and the construction of the main headgate and canal structures under contract with Mr. Sr. Nagauye was completed on April 30, 1926. The system was officially opened on July 1, 1926. The system was unable however, to supply the full amount of water for which the canals were designed owing to the fact that the Tipuluan River shifted its low water channel away from the intake. Insects and other rice pests infested the rice fields in Sibalom and San Jose including those served by the system. Irrigation water was found to be the best means of combating these pests. A fairly good crop, considering the unfavorable circumstances, has been harvested from the irrigated areas, whereas the crop on unirrigated lands was almost a total failure.

An extension of this system estimated to cost ₱65,000 to serve approximately 1,000 hectares of land south of the Egaña River is under consideration. The advisability of building a diversion dam on the Tipuluan River which is roughly estimated to cost ₱300,000 is also being studied.

PROJECTS UNDER CONSTRUCTION

Construction work was under way on the following projects: Peñaranda River Irrigation System in Nueva Ecija, Bulacan and Pampanga provinces, extension of Talavera River Irrigation System in Nueva Ecija Province, and extension and reconstruction of Laoag–Vintar Irrigation System in Ilocos Norte Province. The projects under construction will require a total additional outlay of ₱4,726,000, and will serve, when completed, 25,800 hectares. The status of each of these projects is briefly described hereunder:

Combined Checkgate and Lateral E3 Headgate, Peñaranda River Irrigation System, Nueva Ecija Province

PEÑARANDA RIVER IRRIGATION PROJECT

The excavation of the main canal and laterals is being undertaken by contract with Mr. Sotero Baluyut, contractor of San Fernando, Pampanga, the amount involved being approximately ₱560,000. The rate of progress has been very slow, only 12 per cent of the work having been completed up to December 31, 1926. The construction of the diversion works is under contract with Mr. F. T. Ryan, contractor of Manila. The length of the dam has been increased from 250 to 350 meters in order to provide additional waterway which was found necessary after the unusual flood of June, 1925. The amount involved in the contract has been increased to approximately ₱800,000. The progress of construction has been satisfactory, 30 per cent of the work covered by the contract having been completed at the close of the year. The construction of canal structures in Zone 1 which involves approximately ₱168,000 is also under contract with Mr. F. T. Ryan. The rate of progress was fair, the percentage of work completed at the end of the year being 16 per cent. The construction of the canal structures in Zones II and III is being done by Mr. S. Nagauye, of Manila. The progress of his work has been satisfactory, the percentage of work completed at the end of the year being 17 per cent.

The system is now scheduled for completion by July, 1928. With the changes made in plans, the revised estimate of cost of the project is ₱3,200,000.

EXTENSION OF TALAVERA RIVER IRRIGATION SYSTEM

The construction of the portion of the extension lying southeast of the Dibabuyan River will be completed in time for the next rice planting season. This project not only involves the extension of the canal system but the construction of a diversion dam on Dibabuyan Creek.

LAOAG-VINTAR IRRIGATION SYSTEM

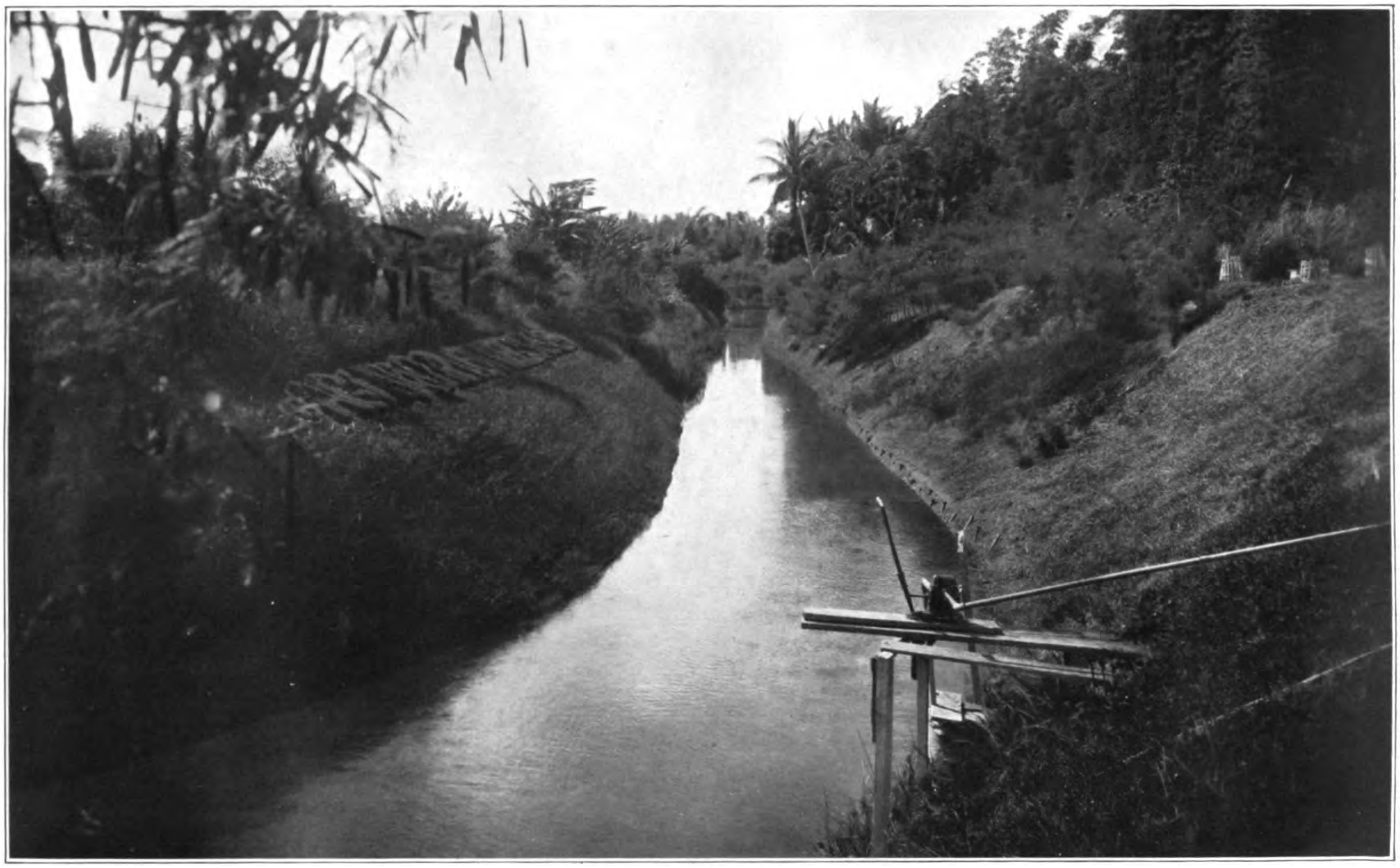
This system was opened on July 1, 1926 and operated until October 8, 1926 when the southern half of the weir was destroyed, after being damaged during the floods of June 14, July 21, and September 26, 1926. The system was unable to deliver water after the October flood. A committee composed of Messrs. Walter J. Grodske, acting chief designing engineer, Luis Francisco, division engineer, and H. O. Bauman, project engineer, was appointed on November 9, 1926 to investigate the causes of the failure of a portion of the dam and to submit necessary data to determine upon the advisability of amending the government's claim against contractor Gordon and Haley, in connection with damages sustained by the diversion works during 1925. While the committee has not as yet submitted its report, it has been established beyond doubt that the failure of the dam was due to the general height of the hydraulic jump and to the lowering of the water surface below the dam as compared with observations made in previous years.

The construction of Pasuquin extension was approved but the necessary funds have not as yet been released.

OPERATION OF SYSTEMS COMPLETED PRIOR TO 1926

There were thirteen irrigation systems in operation serving 28,045 hectares of land which were completed prior to 1926 at a cost of ₱4,548,357. Two of these systems, the Ayala and Santa Maria, are municipal and are administered by the municipal council of Zamboanga; one special, the Trinidad Irrigation System in Benguet Subprovince, is administered by the Bureau of Education; and one insular, the Naic Irrigation System in Cavite Province is administered by the Bureau of Lands. The remaining nine systems are administered by this Bureau.

The rice crop harvested from the lands served by the systems administered by this Bureau showed an increase in yield per hectare of more than 40 per cent over and above the recorded production prior to the opening of the irrigation systems.



Main Canal in Operation, Aganao River Irrigation System, Iloilo Province

A vigorous campaign of enlightenment on the relation of the landowners to the irrigation systems, on the proper method of irrigating crops, and improving farm practices was conducted. Meetings with irrigators were held in twenty-four different municipalities covered by systems administered by this Bureau. These meetings have been productive of very encouraging results.

The collection of irrigation charges showed a marked improvement over the previous years, but it is still far from being satisfactory. Delinquency in the payment of irrigation charges has been largely due to lack of information on the part of the irrigators of the rules and regulations governing the operation and maintenance of irrigation systems, to undesirable propaganda that payment of irrigation charges may be condoned or deferred, and to inherent defects in the Irrigation Act. Difficulties arising from the first two causes mentioned above have been to a great extent removed as a result of the intensive campaign of enlightenment that was carried out during the past year. The third cause lies in the fact that delinquency in payment is not penalized under the existing legislation. Court proceedings were instituted against a number of landowners on the Burgos, Dingras, Santa Barbara, Aganao, and Talavera River Irrigation Systems for delinquency in the payment of irrigation charges. Favorable decisions have been rendered in all these cases which are expected to have a salutary effect in the future.

The planting of ipil-ipil and kapok trees on the main canal banks for protective and revenue purposes has been encouraged in all the systems.

Water deliveries under the Dingras and Dipolog systems have not been very satisfactory but improvements are contemplated to make these systems more efficient.

A new contract was entered into on September 6, 1926, between the Government and the Compañía General de Tabacos de Filipinas covering the operation and maintenance of the San Miguel Irrigation Systems. Under the terms of the contract the Compañía General de Tabacos de Filipinas will make annual payments to the Government before January 31, of each year of ₱29,000 and must maintain at its expense the canal system blow the settling basin.

IRRIGATION PROJECTS UNDER CONSIDERATION

Complete preliminary estimates of cost were made during the past year on the Tarlac River Irrigation Project in Tarlac Province and the Pampanga River Irrigation Project in Nueva Ecija Province. The Tarlac River Irrigation Project is estimated to cost ₱4,200,000 and to serve approximately 25,000 hectares of land and will be recommended for construction at an early date. The Pampanga River Irrigation Project will irrigate approximately 22,000 hectares and is estimated to cost ₱3,300,000.

After deducting the amount already spent on completed projects totalling ₱8,822,518.99, the amount of ₱4,726,000 for completing projects under way, and the amount of ₱1,075,000 for projects approved for construction, from the net proceeds of the sale of bonds authorized by Acts Nos. 2140 and 3011 amounting to ₱19,123,542.94, there will be available for further irrigation construction the sum of ₱5,125,838.95.

The following table gives the location, approximate irrigable area, and status of the more important projects under consideration:

Province	Project	Irrigable area	Status
		Hectares	
Abra	Abra River	4,000	Awaiting investigation.
Albay	Quinali-Lake Bato	6,000	Do.
Do	Malinao-Tabaco	600	Do.
Camarines Norte	Daet	2,000	Topographic survey completed.
Do	Talisay-Indan	5,000	Do.
Camarines Sur	San Jose-Hagonoy	5,000	Awaiting investigation.
Do	Pauili Valley	2,000	Topographic survey completed.
Do	Barit River	2,000	Awaiting investigation.
Bataan	Dinalupihan	2,500	Do.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
Do	Mambusao	1,000	Preliminary investigation, 1911.
Do	Macato-Malinao	1,200	Do.
Do	Ibahay	500	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Investigation in progress.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
Do	Candon	1,000	Recommended for construction, Act 2755.
Do	Santa Cruz	1,000	Preliminary survey completed.
Do	Santa Lucia and Candon	1,900	Recommended for construction, Act 2755.
Cebu	Balamban River	1,200	Awaiting investigation.
Batangas	Batangas	1,000	Investigation in progress.
Do	Balayan	300	Do.
Do	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Preliminary estimate of cost made.
Do	Pototan	2,300	Survey and preliminary design made.
Do	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Topographic survey completed.
La Union	Balaoan	1,200	Awaiting further investigation.
Do	Bacnotan	2,000	Topographic survey completed.
Do	Agoo-Tubao	2,000	Awaiting investigation.
Do	Naguilian	1,000	Preliminary survey completed.
Do	Rosario	1,000	Topographic survey completed.
Do	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	1,000	Preliminary estimate of cost made.
Do	Palo	1,000	Preliminary investigation completed.
Do	Dagami-Tanauan	14,000	Awaiting investigation.
Do	Bato-Hilongos	3,000	Awaiting investigation.
Mindoro	Bucayao River	2,000	Do.
Nueva Ecija	Pampanga River	25,000	Preliminary estimate of cost made.
Nueva Vizcaya	Murong	1,200	Topographic survey completed.
Occidental Negros	Binalbagan-Himamaylan	3,000	Do.
Do	Bago	20,000	Preliminary estimate of cost made.
Do	Silay	5,000	Awaiting investigation.
Oriental Negros	La Granja Extension Station.	200	Investigation in progress.
Do	Tanjay	800	Awaiting investigation.
Do	Tolong	3,000	Preliminary investigation made.
Palawan	Iwahig Penal Colony	2,000	Topographic survey in progress.
Pampanga	Porac	1,000	Topographic survey completed.
Do	Bamban	3,000	Do.
Do	Gamain	5,000	Do.
Pangasinan	Agno	40,000	Topographic survey completed.
Do	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do	San Fabian	4,000	Do.
Do	Banila	5,000	Topographic survey completed.
Rizal	Mariquina Valley	5,000	Topographic survey completed.
Do	Pililla	180	Recommended for construction Act 2755.
Do	Morong	590	Do.
Tarlac	Tarlac	25,000	Preliminary estimate of cost made.
Tayabas	Mayao	2,500	Awaiting investigation.
Zambales	Santo Tomas	9,000	Preliminary estimate of cost made.
Do	Toton-Lanom	600	Preliminary survey completed.
Do	Iba	400	Do.

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the Division made 1,859 discharge measurements and kept daily gage height records at 132 permanent gaging stations. Seventeen discharge measurements were made at temporary stations during 1926. Records were also kept for 32 rain gages established in localities distant from Weather Bureau's gages.

WATER RIGHTS

A total of 192 new applications for water rights was received during the year, 185 of which were for irrigation, two for domestic, and five for power development purposes. A total of 122 applications was finally acted upon, 108 of which were granted and 14 disapproved by the Honorable, the Secretary of Commerce and Communications upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 56,432.30 hectares of land.

There were five applications for power development filed during the year. Six applications for power development were approved for developing a maximum of 4,250 horse power.

There are five streams which were designated for adjudication during the past year.

Final and provisional lists of priorities for the following streams which have been surveyed and investigated are being prepared:

Stream	Province	Number of diversion ditches	Length of main canal in meters	Number of municipalities affected	Approximate number of hectares of land irrigated
					Hectares
Ange and Gogo Rivers [2]	Pampanga	25	970	4	5,200
Porac River [1]	do.	14	12,825	4	2,326
Gumain River [1]	do.	7	37,236	4	2,820
Culamin River [1]	Pampanga and Bataan.	3	31,643	4	4,065
Banila River	Pangasinan	50	10,000	4	25,000
Andulan or Burubor River [2]	do.	30	1,000	4	1,300
Bued or Nantayagan River [2]	Nueva Ecija and Pangasinan.	10	1,000	2	2,500
Parasapas Creek [2]	Pangasinan	2	500	2	1,500
Malabago or Anondaan River [1]	do	5	3,000	4	1,000
Total					45,711

NOTE.—[1] Final list. [2] Provisional list.

Surveys and investigations on the following streams have been suspended due to lack of funds.

Stream	Province	Municipality affected	Approximate area of land irrigated
			Hectares
Lubnac Estero	Ilocos Norte	Sarrat	300
Burnay River	do.	Solsona and Dingras	1,500
Nagdesaagan River	do.	Piddig	800
Maoguing-oguing River	do.	Dingras	500
Padsan River	do.	Banna	1,900
Maolo River	Pangasinan	Sison and Pozorrubio	2,500
Total			7,500

Surveys are in progress with surveying parties in the field on the following streams:

Stream	Province	Municipality affected	Approximate area of land irrigated
			Hectares
Gogo and Bugo Esteros	Tarlac	Concepcion	3,000
Parua River	Pampanga and Tarlac	Mabalacat, Bamban, and Concepcion.	8,000
Total			11,000

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream	Province	Municipality affected	Approximate area of land irrigated
			Hectares
Nagubuuban Estero	Ilocos Norte	Badoc	300
Banglayan River	Ilocos Sur	Narvacan	2,200
Codoog or Barangobong River.	do.	Narvacan and Nagbukel.	1,000
Nasisi River	Albay	Ligao and Oas	1,000
Ynarihan River	Camarines Sur	Naga, Magarao, and Calabanga.	1,200
Pias Estero	Tarlac	Moncada and San Manuel.	5,000
Immanduyan or Aloragat River.	Pangasinan	Mapandan, Manaoag, Binalonan, Pozorrubio, and Sison.	5,000
Del Carmen Creek	Pampanga	San Fernando and Mexico.	5,000
Mutua Creek	do.	Santa Rita, Guagua, Bacolor, and Porac.	800
Labasin and Bulaquin Rivers	Tayabas and Laguna	Tiaong, Dolores, and San Pablo.	300
Lusuao Spring	Abra	Bangued and Peñarubia.	300
Lagasit River	Pangasinan	Tayug, Sta. Maria, San Quintin, Rosales, and Balungao	2,000
Sta. Maria or Villaviejo River.	Ilocos Sur and Abra	Narvacan, Sta. Maria, and Pilar	2,000
San Juan River	Bataan	Samal	300
Paed River	Pangasinan	Alaminos	300
Total			24,700

RIVER CONTROL PROJECTS

Funds totalling ₱197,500 were released during the year from the 1926 public works appropriations authorized under Act No. 3258 for the construction of San Francisco River Dyke, Guinobatan, Albay province; for the construction of a dyke on the Govantes River, Vigan, Ilocos Sur Province; for drainage improvement of the eastern portion of Balayan, Batangas Province; for the repair and improvement of the Pansipit River Dyke in Lemery, Batangas Province; for the extension and maintenance of dykes along the banks of the Agno River in Pangasinan Province; for the maintenance of Pampanga River Dyke in Pampanga Province; for the repair and maintenance of the Boac River bank revetment in Marinduque Province; and for the construction of the Sariaya River Control Works in Tayabas Province.

The work of the Division on these projects was confined to field investigations and the preparation of plans and estimates of cost. Construction work was carried out under the supervision of district engineers.

Pipe Trench Excavation, Iloilo Waterworks showing 24 inch Mannesmann pipes used for main pipe line

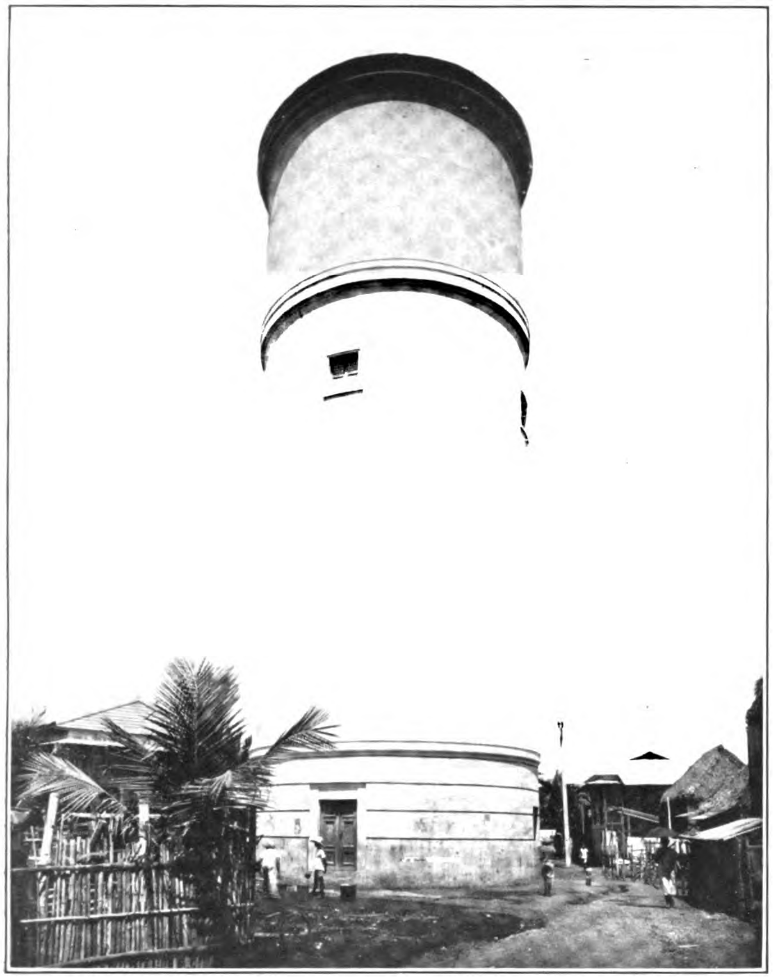
The Division had under consideration during the past year, 56 river control projects as shown in the following table:

RIVER CONTROL PROJECTS UNDER CONSIDERATION

Province	Municipality	River	Type of work	Esrimated cost or funds available	Status
Abra	Bucay	Patoc Creek	Construction of headgate		Preliminary studies.
Do	Bangued	Abra	Bank revetment		Preliminary investigation.
Albay	Libon*Y*	Calacran	Channel improvement and levee	₱40,000	Preliminary plans.
Do	Guinobatan	San Francisco	Bank revetment	9,300	Do.
Do	Malinao	Malinao	Spur dyke	50,000	Preliminary investigation.
Antique	Barbasa	Binangbang	Bank revetment		Do.
Do	Colasi	Bacong	Channel diversion	40,000	Preliminary investigation and plans.
Do	Tibiao	Tibiao	Earh dyke		Preliminary report.
Batangas	Balayan	Balayan	Drainage improvement		Completed.
Do	Batangas	Calumpang	Bank revetment	70,000	Do.
Do	do	Pansipit	Repair and improvement	5,500	Awaiting construction.
Cagayan	Lal-lo	Cagayan	Bank revetment	38,000	Preliminary investigation.
Camarines Sur	Goa	Rangas	Channel improvement		Preliminary studies.
Cebu	Barili	Mantayupan	Levee around town	30,000	Do.
Do	Carcar	Carcar	do	35,000	Do.
Do	Danao	Danao	Earth dyke	4,000	Completed.
Do	Argao	Argao	Bank revetment		Preliminary investigation.
Ilocos Norte	Solsona	Solsona	Bank revetment, channel improvement		Do.
Do	Vintar	Vintar	Bank revetment		Preliminary studies.
Ilocos Sur	Vigan	Govantes	Earth dyke and roadway	72.000	Completed.
Do	Magsingal	Parsua	Bank revetment		Preliminary investigation.
Iloilo	Cabatuan	Cabatuan	do	8,000	Awaiting construction.
Do	do	Tigum	Earth dyke		Preliminary investigation.
Do	Miagao	Miagao	Bank revetment		Do.
Lanao	Iligan	Mandulog	do		Do.
La Union	Agoo	Agoo	Channel diversion and improvement		Preliminary report.
Do	Bangar	Amburayan	Causeway	90,000	Awaiting construction.
Do	Caba	Caba			Preliminary investigation.
Do	Balaoan	Maluyo	Channel diversion		Completed. Constructed in connection with Amburayan River irrigation project.
Do	Luna	Busilac	Earth dyke		Preliminary investigation.
Do	Santo Tomas	Manacliw			Do.
Leyte	Alang-alang	Mainit	Bank revetment		To be construed from road funds.
Do	Biliran	Cabugayan			Preliminary investigation.
Nueva Ecija	Cabanatuan	Rio Grande			Do.
Nueva Vizcaya		Magat			Do.
Manila	Manila	Pasig	Flood canal		Do.
Mindoro	San Jose	Bugsanga	Channel improvement		Do.
Occidental Negros	Binalbagan	Binalbagan	Channel diversion and dyke		Preliminary plans.
Do	Cadiz	Cadiz	Bank revetment and jetty		Preliminary report.
Do	Ilog	Ilog	Bank revetment and dyke		Preliminary studies.
Oriental Negros	Tanjay	Tanjay	Improvement of spur dyke		Do.
Pampanga	Mabalacat and Magalang.	Babas and Bangkal	Channel improvement and diversion		Preliminary report.
Do	Macabebe and Masantol		Earth levee		Preliminary studies.
Do	Sta. Rita, Betis, Bacolor, and Guagua.	Potrero or Pasig	Channel diversion and improvement and earth dyke.		Topographic survey completed.
Do	Arayat, San Luis, San Simon, and Apalit.	Pampanga	Maintenance and improvement existing dyke on right revetment.	15,000	Construction in progress.
Do	Sexmoan	Pasag	Bank revetment		Preliminary investment completed.
Pangasinan	Asiñgan	Agno	Earth dyke		
Do	Bayambang	do	Earth dyke and cut-off channel	50,000	Completed.
Do	do	do	Hermosa-Oaoa Dyke	50,000	Do.
Do	Bautista and Alcala	do	Earth dyke	50,000	Awaiting construction.
Do	Rosales	Banila	Channel diversion	100,000	Do.
Do	Tayug	Ambayuan, Viray, and Dipalo.			Preliminary investigation.
Samar	Catarman	Catarman	Repairs to existing spur dykes	12,000	Under way.
Sorsogon	Bacong	Rangas	Protection dyke		Preliminary investigation.
Tarlac	Tarlac	Tarlac	Earth dyke	12,000	Completed.
Tayabas	Sariaya	Sariaya and Lagnas	Channel diversion and improvement	25,000	Under way.

SEWERAGE SYSTEMS

The construction of the Lucena storm drain system in Tayabas Province started during 1925, was reported 70 per cent completed at the end of the year. Sewer lines, curbs, and gutters have been laid in the main streets of the poblacion. The system is estimated to cost ₱180,000 when completed. The sum of ₱50,000 from municipal funds and ₱50,000 from insular appropriations has been allotted to this project.



100,000-Gallon Tank, Cavite Waterworks

Preliminary plans and estimates of cost were prepared during the year for the following projects:

1. Cavite storm drain system, Cavite Province	₱60,000
2. Cavite domestic sewege system, Cavite Province	95,000
3. Cebu domestic sewege system, Cebu Province	440,000
4. Lucena domestic sewege system, Tayabas Province	120,000
5. Vigan domestic sewege system, Ilocos Sur Province	110,000
Total	825,000

WATERWORKS

The Division prepared plans and specifications for 14 municipal waterworks projects on which construction work was started during 1926. These projects will furnish potable water to a total population of 126,900 at an estimated cost of ₱2,401,300. Preliminary designs and estimates were also made for 37 provincial and municipal waterworks projects, most of which are to be financed from loans. These projects will supply 142,850 people at an estimated cost of ₱2,228,700.

Construction work was completed by district engineers on 21 waterworks projects started during the previous year, leaving 35 projects under construction at the end of the year. The 21 completed projects cost ₱634,647.42 and serve a total population of 57,560 while the 35 projects still under way are estimated to cost ₱3,174,500 and will provide a potable water supply for 201,830 people.

There are 99 waterworks projects under consideration which contemplate furnishing water to a total population of 390,019 and are estimated to cost approximately ₱6,426,900. As soon as the municipalities concerned are able to finance these projects, construction work may be undertaken, excepting a few projects which require further investigation.

There are 144 municipal and provincial waterworks systems in the Philippines, excluding the Manila Metropolitan Water System, thus far completed which furnish potable water to a total population of 479,252 and have cost ₱5,696,967.86.

The status of all waterworks projects to date is shown in the accompanying lists as follows:

Table A—Waterworks projects under construction.
Table B—Waterworks projects completed.
Table C—Waterworks projects under consideration.

TABLE A.—*Waterworks projects under construction*

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Albay	Camalig [a]	Gravity	2,500	₱12,000.00	₱8,000.00	₱4,054.90
Do	Jovellar [a]	do.	2,500	10,500.00	7,000.00	3,500.00
Do	Tabaco [a]	do.	5,500	37,000.00	24,000.00	15,000.00
Antique	Culasi [a]	do.	1,700	30,000.00	20,000.00	10,000.00
Bataan	Sisiman [a]	do.		13,000.00	13,000.00	
Bohol	Anda [a]	do.	2,500	20,000.00	13,000.00	8,104.00
Do	Inabanga	do.	4,000	40,200.00	26,800.00	16,700.00
Do	Loboc	do.	3,000	23,000.00	12,000.00	9,181.75
Do	Loon	do.	5,000	33,000.00	22,000.00	11,000.00
Bulacan	Malolos	Pumping	6,000	123,000.00	80,000.00	41,526.45
Cavite	Cavite	do	10,900	120,000.00	49,000.00	77,035.79
Cebu	Balamban [a]	Gravity	4,800	26,000.00	15,000.00	11,130.00
Do	Carcar (Improvement)	do.	4,000	30,000.00		
Iloilo	Iloilo Metropolitan Water-Works [a]	do.	91,500	2,100,000.00	75,000.00	1,587,938.56
Ilocos Norte	Badoc [a]	Pumping	2,800	37,000.00	24,500.00	12,418.50
Ilocos Sur	Bantay [a]	Gravity	2,500	9,000.00	4,000.00	2,557.49
Laguna	Luisiana	do.	4,500	48,000.00	32,000.00	16,000.00
Do	Magdalena	do.	3,000	68,000.00	42,400.00	21,210.79
Do	Rizal	do.	3,000	27,000.00	18,000.00	9,000.00
Leyte	Baybay	do.	8,000	70,000.00	44,000.00	25,000.00
Marinduque	Torrijos	do.	5,000	24,000.00	14,000.00	8,000.00
Mountain Province	Lubuagan	do.	1,200	8,000.00	5,000.00	
Oriental Negros	Guihulñgan [a]	do.	3,500	21,000.00	14,000.00	7,161.81
Do	Libertad [a]	do.	1,600	40,800.00	20,000.00	10,000.00
Do	Vallehermoso [a]	do.	2,500	21,000.00	12,000.00	6,643.19
Palawan	Bacuit	do.	1,000	3,200.00	2,500.00	700.00
Do	Balabac Extension	do.	800	5,000.00	3,200.00	
Do	Barrio Bintuan	do.	1,000	5,500.00	3,700.00	1,000.00
Do	Culion	Gravity and pumping	5,000	35,000.00	35,000.00	
Do	Cuyo	Pumping	800	10,000.00	6,650.00	3,000.00
Do	Oton	Gravity	330	5,000.00	3,000.00	
Do	Puerto Princesa-(Improvement)	Pumping	400	3,300.00	2,200.00	
Pangasinan	San Manuel	Gravity	4,000	38,000.00	20,000.00	18,000.00
Tayabas	Sampaloc [a]	do.	3,000	24,000.00	16,000.00	8,000.00
Zambales	San Antonio	do.	4,000	54,000.00	25,000.00	(b)
Total			201,830	3,174,500.00	711,950.00	1,943,863.23

[a] Projects started in 1926.

TABLE B.—*Waterworks projects completed*

Province	Municipality	Cost	Population served	System	Capacity of system, gallons per day
Abra	Bangued	₱130,755.85	6,600	Gravity	180,000
Albay	U. S. Reservation Regan Barracks and Legaspi.	60,000.00	5,000	Pumping	209,200
Do	Guinobatan[a]	49,853.81	5,000	Gravity	288,000
Antique	Bugason[a]	18,306.56	2,500	do	44,000
Do	San Jose	41,846.74	4,000	Pumping	47,520
Batangas	Balayan	7,353.92	2,000	Gravity	100,800
Do	Batangas	71,529.96	6,147	Pumping	144,000
Do	Bauan[a]	41,983.96	4,700	do	93,600
Do	Cuenca	5,000 00	2,500	Gravity	5,040
Do	Lemery	47,132.84	7,200	Pumping	200,000
Do	Lipa	103,065.87	5,000	do	172,800
Do	Rosario[a]	20,232.67	5,000	do	223,200
Do	San Jose[a]	44,099.45	4,000	Gravity	216,000
Do	Santo Tomas	27,108.65	1,910	do	50,400
Do	Taal	91,188.34	5,000	Pumping	187,200
Do	Taal Extension	57,220.41	4,000	do	80,000
Do	Talisay[a]	15,562.81	2,130	Gravity	64,800
Do	Tanawan	55,615.02	2,500	do	45,000
Bohol	Calape[a]	26,521,41	2,600	do	156,000
Do	Dauis	5,100.00	840	do	77,760
Do	Duero	10,823.56	2,000	do	86,400
Do	Jagna	24,115.26	3,000	do	43,200
Do	Loay	18,968.72	3,000	do	144,000
Do	Mabini	6,750.00	1,300	do	72,000
Do	Tagbilaran	13,837.47	5,245	Pumping	77,760
Do	Tubigon	37,094.06	4,800	do	100,800
Bukidnon	Deliric	(c)	600	Gravity	4,320
Do	Balaybalay	11,641.16	1,300	do	20,160
Do	San Luis	650.00	500	do	
Bulacan	Hagonoy	7,564.87	2,789	do	50,400
Do	Marilao	22,101.50	(b)	do	
Do	Sibul, San Miguel.	256,000.00	(b)	do	
Camarines Norte	Mambulao	1,200.00	1,823	do	
Do	Paracale[a]	8,544.03	2,500	do	100,800
Capiz	Capiz	13,541.92	6,400	do	264,170
Cavite	Indang	39,627.40	3,000	Pumping	144,000
Do	Mendez-Nuñez	60,700.00	1,600	do	57,600
Do	Silang	36,154.89	4,000	Gravity	100,000
Cebu	Barili	26,958.28	2,067	do	61,200
Do	Carcar	64,004.45	4,463	do	216,000
Do	Catmon	16,399.56	1,624	do	38,000
Do	Cebu	526,000.00	65,000	do	806,400
Do	Cebu-Labangan	16,000.00		do	576,000
Do	Cebu-Sambag	35,789.18		Pumping	187,200
Do	Cordova	4,810.74	1,191	Gravity	30,000
Do	Daan-bantayan	5,672.99	579	do	30,000
Do	Dalaguete	14,941.15	3,500	Pumping	36,000
Do	Dalaguete Extension[a]	27,372.84		Gravity	57,600
Do	Dumanjug	35,638.29	1,500	Pumping	187,200
Do	Ginatilan	13,404.80	2,669	Gravity	43,200
Do	Mainit	2,000.00		do	
Do	Malabuyoc	14,941.15	1,500	do	104,540
Do	Moalbual	14.297.27	2,108	do	54,720
Do	Naga	6,800.00	3,233	do	79,200
Do	Naga Extension	4,552.48		do	
Do	Opon	36,568 44	1,500	Pumping	144,000
Do	Pilar	5,019.21	702	Gravity	14,400
Do	Poro	8,873.63	1,000	do	21,600
Do	Samboan	7,514.11	2,741	do	49,250
Do	San Isidro	1,388.13	650	do	34,560
Do	San Fernando[a]	20,273.17	3,000	do	108,000
Do	San Francisco	6,200.00	1,243	do	10,000
Do	Sibonga	35,300.00	2,661	do	63,360
Do	Tuburan	55,335.55	3,900	do	120,960
Do	Tudela	8.263.29	851	do	24,480
Cotabato	Parang	9.600.00	600	Pumping	21,600
Davao	Davao	137,195.14	6,000	Gravity	86,400
Ilocos Sur	Vigan	127,399.52	8,440	do	201,600
Isabela	Ilagan	(d)		Rain-Tank	40,000
Laguna	Alaminos[a]	28,496.85	1,130	Gravity	95,000
Do	Bay	2,767.72	1,471	do	86,400
Do	Calamba[a]	75,275.98	7,000	Pumping	288,000
Do	Lilio[a]	36,845.27	4,500	Gravity	316,800
Do	Majayjay	38,686.06	3,200	do	187,200
Do	Nagcarlan	36,034.42	2,500	do	180,000
Do	Pagsanjan	73,782.67	4,044	Pumping	233.280
Do	San Pablo	89,455.82	7,000	Gravity	576,000
Do	Santa Cruz	92,692 43	6,000	Pumping	352,800
La Union	San Fernando[a]	92,732.94	5,000	Gravity	300,000
Marinduque	Boac	₱6,653.00	1,000	Pumping	57,600
Do	Gasan	22,124.97	1,400	do	144,000
Do	Malbog	13,614.29	1,000	Gravity	61,920
Do	Mogpog	10,535.69	1,280	do	18,288
Do	Santa Cruz	20,696.23	2,560	do	158,400
Mindoro	Abra de Ilog	4,743.74	350	do	14,400
Do	Bulalacao[a]	3,232 08	700	do	43,200
Do	Calapan	29,743.47	2,500	Pumping	57,600
Misamis	Balingasag	8,924.14	1,514	Gravity	57,600
Do	Cagayan	50,408.82	3,000	Pumping	86,400
Do	Mahinog	6,000.00	5,727	Gravity	
Do	Mambajao	30,000 00	14,446	do	
Do	Sagay	800.00	6,321	do	
Mountain Province.	Baguio	229,605.89	6,000	Pumping and gravity.	350,000
Do	Cervantes	7,565.07	800	Gravity	
Do	Mansion House	2,144.58	100	Pumping	40,000
Do	Teacher's Camp	(c)	1,500	do	216,000
Do	Trinidad Farm School.	19,330.93	300	Gravity	36,000
Do	Trinidad Stock Farm.	2,000.00	60	do	8,640
Nueva Ecija	Cabanatuan	111,302.49	6,000	Pumping	100,000
Do	Muñoz Agriculture School[a]	10,000.00	1,000	do	86,400
Oriental Negros	Basac	(c)	265	do	
Do	Dauin[a]	22,296.01	1,500	Gravity	57,600
Do	Dumaguete	84,131.43	4,000	Pumping	288,000
Do	Larena	(c)			
Do	Lazi	6,980.77	2,300	Gravity	
Do	Luzuriaga	12,317.44	2,500	do	269,200
Do	Maria	1,350.05	1,000	do	7,400
Do	Maria Extension	2,677.41			
Do	Siquijor	18,000.00	1,587	do	
Do	Siquijor Extension.	(c)	494	do	
Do	Talingting	5,025.00	2,890	do	6,480
Palawan	Coron	7,844 63	1,150	Pumping	20,160
Do	Puerto Princesa	10,268.45	716	do	28,800
Pampanga	Angeles	12,318.52	6,708	do	61,920
Do	Arayat	35,180.95	3,840	Gravity	144,000
Do	San Fernando	1,050.02	1,000	Pumping	86,400
Pangasinan	Alcala	3,000.00	2,200	Gravity	129,600
Do	Bani	12,411.86	2,000	do	86,400
Do	Bayambang	8,652.80	2,400	do	108,000
Do	Dagupan	2,823.02	(e)	do	
Do	Lingayen	3,938.99	(e)	do	
Do	do	9,141.22	(f)	do	
Do	do	96,682.22	7,000	Pumping	288,000
Do	Mangaldan	635.53	(e)	Gravity	122,400
Do	San Fabian	682.87	(e)	do	57,600
Rizal	Antipolo	23,299.07	2,250	Pumping	82,080
Do	Pasig	40,000.00	10,000	do	86,400
Romblon	Looc	27,760.12	2,000	Gravity	144,000
Do	Romblon	(c)	2,300	do	
Samar	Calbayog	(c)	(e)	do	20,000
Do	Catbalogan	64,308.94	2,000	do	55.000
Do	Oras	(c)	4,000	do	
Sorsogon	Bacon	21,000.00	3,200	do	79,200
Do	Magallanes	8,000.00	3,500	Pumping	
Do	Sorsogon	70,701.49	6,000	Gravity	206,000
Do	do	1,044.67	250	Pumping	36,000
Sulu	Jolo	76,974.29	5,000	do	115,200
Surigao	Barrio Bacuag, Gigaquit.	7,500.00	2,405	Gravity	
Do	Lianga	1,924.58	1,290	do	2.880
Do	Placer	13,133.95	870	do	18.720
Tarlac	Moncada	22,122.26	3,000	do	86,400
Tayabas	Candelaria[a]	60,646.04	3,500	do	216,000
Do	Infanta[a]	4,424.55	1,200	Rain Tank	40,000
Do	Gumaca[a]	4,482.17	1,600	do	40,000
Do	Lucban	50,205.60	3,200	Gravity	316,800
Do	Lucena	234,390.57	7,500	do	262,000
Do	Mauban	57,209.32	3,500	Pumping	144,000
Do	Mulanay[a]	17,369.53	1,200	Gravity	180,000
Do	Pagbilao	70,538.47	2,300	do	54,700
Do	Sariaya	37,935.00	6,000	do	201,600
Do	Tayabas	125,159.36	4,600	do	173,000
Do	Tiaong[a]	49,694.74	1,800	do	187,200
Zambales	Subic	10,670.62	1,628	do	11,520
Zamboanga	Zamboanga	305,561.30	5,000	do	504,000
Total		5,696,967.86	479,252		

[a] Projects completed in 1926. [b] Bath house. [c] No data. [d] No record. [e] Market. [f] School.

TABLE C.—*Waterworks projects under consideration*

Province	Municipality	Estimated cost	Population to be served	System
Albay	Daraga[a]	₱250,000.00	10,000	Gravity.
Do.	Legaspi[a]		10,000	Do.
Do.	Ligao[a]	244,000.00	6,000	Do.
Do.	Oas[a]		6,000	Do.
Do.	Libon[a]	244,000.00	3,000	Do.
Do.	Polangui[a]		8,000	Do.
Antique	Patnongon[a]	15,000.00	1,000	Do.
Do.	San Jose Extension	40,000.00	1,500	Pumping.
Do.	Sibalom	27,000.00	2,500	Gravity.
Batanes	Itbayat	₱15,000.00	1,000	Gravity
Do.	Ivana.	50,000.00	2,000	Do.
Do.	Uyugan		1,500	Do.
Batangas	Batangas	400,000.00	10,000	Do.
Do.	Bauan		5,200	Do.
Do.	Ibaan		2,700	Do.
Do.	San Jose		2,100	Do.
Do.	Lipa Extension	7,000.00		Pumping.
Bohol	Carmen	6,100.00	600	Gravity.

[a] Projects for which design and estimate were made in 1926.

TABLE C.—*Waterworks projects under consideration*—Continued

Province	Municipality	Estimated cost	Population to be served	System
Bohol	Corrella	₱6,000.00	1,019	Gravity
Do.	Dimiao	12,000.00	1,500	Do.
Do.	Garcia-Hernandez	31,500.00	2,000	Do.
Do.	Guinduman [a]	21,000.00	2,000	Do.
Do.	Lila [a]	6,000.00	700	Do.
Do.	Loay Extension	3,200.00	500	Do.
Do.	Valencia	20,000.00	1,435	Do.
Bukidnon	Impasugong	36,000.00	1,600	Do.
Bulacan	Baliuag [a]	120,000.00	8,000	Pumping.
Do.	Bulacan [a]	80,000.00	6,000	Do.
Do	Malolos Extension	5,000.00	1,100	Do.
Do.	Marilao [a]	6,000.00	1,200	Do.
Do.	Obando [a]	75,000.00	5,000	Do.
Do.	Pulilan	18,000.00	3,000	Gravity.
Do.	San Ildefonso	45,000.00	2,500	Pumping.
Do.	San Miguel	75,000.00	7,000	Do.
Cagayan	Aparri	346,000.00	9,200	Do.
Do.	Camalaniugan		2,348	Do.
Do.	Lal-lo		1,382	Do.
Do.	Tuguegarao	200,000.00	10,000	Gravity.
Camarines Sur	Iriga [a]	70,000.00	10,000	Pumping.
Do.	Camaligan	300,000.00	1,500	Do.
Do.	Canaman		1,500	Do.
Do.	Magarao		4,000	Do.
Do.	Naga		7,000	Do.
Do.	Pasacao [a]	5,100.00	1,000	Gravity.
Cavite	Dasmariñas [a]	31,000.00	5,000	Do.
Cebu	Alegria	12,000.00	1,000	Do.
Do.	Asturias	27,000.00	1,086	Pumping.
Do.	Argao	39,000.00	4,500	Gravity.
Do.	Badian	30,000.00	1,700	Do.
Do.	Bantayan [a]	20,000.00	4,000	Pumping
Do.	Barili Extension	8,600.00	300	Gravity.
Do.	Cebu Extension [a]	48,000.00	1,000	Do.
Do.	Danao [a]	42,000.00	2,500	Do.
Do.	Dumanjug Improvement	32,000.00	3,210	Do.
Do.	Mandaue	35,000.00	2,500	Do.
Do.	Minglanilla [a]	12,000.00	1,500	Do.
Do.	Moalboal Extension	25,200.00	3,000	Do.
Do.	Oslob	15,000.00	2,000	Do.
Do.	Ronda	30,000.00	1,880	Do.
Do.	San Francisco improvement	27,000.00	....	Do.
Do.	Sogod	13,500.00	3,200	Do.
Do.	Talisay	30,000.00	2,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Pumping.
Ilocos Norte	Laoag	750,000.00	20,000	Gravity.
Do.	Pasuquin		5,800	Do.
Do.	Bacarra		8,500	Do.
Ilocos Sur	Caoayan	13,500.00	1,700	Do.
Do.	Santa	24,000.00	875	Do.
Do.	Santa Catalina [a]	30,000.00	1,500	Do.
Ilocos Sur	San Vicente [a]	₱32,000.00	2,000	Gravity
Iloilo	Pototan-Dingle	279,000.00	9,200	Do.
Do.	San Dionisio	15,000.00	1,500	Do.
Laguna	Lilio Extension	27,500.00	2,500	Do.
Do.	Paete [a]	25,000.00	4,500	Do.
Do.	Pila	60,000.00	2,171	Pumping.
Do.	San Pablo Extension [a]	3,500.00	....	Gravity.
La Union	Rosario	10,000.00	1,050	Do.
Leyte	Liloan	7,000.00	700	Do.
Do.	Maasin [a]	30,000.00	3,300	Do.
Do.	Villaba [a]	9,000.00	1,700	Do.
Masbate	Aroroy [a]	8,000.00	1,000	Do.
Do	San Fernando	21,000.00	2,500	Do.
Misamis	Cagayan Improvement	38,000.00	5,000	Do.
Do	Jasaan	20,000.00	2,500	Do.
Do	Jimenez [a]	30,000.00	4,000	Do.
Do	Misamis	66,000.00	3,450	Pumping.
Mountain Province	Bontoc [a]	36,000.00	2,000	Gravity.
Occidental Negros	Bacolod	202,000.00	8,000	Do.
Do	Silay [a]	461,000.00	6,000	Do.
Do	Sumag [a]		1,300	Do.
Do	Talisay [a]		6,000	Do.
Do	Calatrava [a]	37,500.00	1,500	Do
Do	Pinucutan [a]	2,300.00	....	Do.
Oriental Negros	Bacong [a]	27,000.00	1,800	Do.
Do	Luzuriaga Extension [a]	8,500.00	650	Do.
Do	Manjuyod	12,000.00	2,000	Do.
Do	San Juan	21,000.00	2,000	Do.
Do	Tanjay [a]	42,000.00	3,000	Do
Palawan	Concepcion	3,600.00	600	Do.
Do	Coron Improvement	13,000.00	600	Do.
Pampanga	Angeles	80,000.00	8,000	Pumping.
Pangasinan	Malasiqui	30,000.00	2,613	Do.
Do	Urdaneta [a]	1,800.00	....	Gravity.
Rizal	Pasig Extension	27,000.00	5,200	Pumping.
Romblon	Odiongan [a]	45,000.00	3,000	Gravity.
Samar	Llorente	14,000.00	2,500	Pumping.
Do	Oras Improvement	10,000.00	3,500	Gravity.
Sorsogon	Barcelona	25,500.00	4,000	Do.
Do	Casiguran [a]	70,000.00	5,000	Do.
Do	Gubat	78,000.00	7,000	Do.
Surigao	Surigao	70,000.00	6,400	Do.
Tarlac	Tarlac	120,000.00	6,000	Pumping.
Tayabas	Atimonan	117,000.00	6,000	Gravity.
Do	Guinayangan [a]	21,000.00	1,500	Do.
Do	San Narciso	15,000.00	1,000	Do.
Do	Tayabas Extension [a]	20,000.00	1,200	Do.
Total		6,426,900.00	390,019	

[a] Projects for which design and estimate were made in 1926.

APPENDIX

ACTIVE PROJECTS, JANUARY 1, 1927

Provinces	Roads and trails			Bridges and culverts			Provincial capitols			Presidencias		Prisons			Schools		Markets and tiendas		Hospitals			Miscellaneous buildings			Water systems			Electric light plants			Artesian wells			Port works			Miscellaneous projects						Total
	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Wireless stations	Surveys and investigations	Irrigation systems	River control	Monuments	Unclassified	
Abra	3	3		1										1	4							1		1	1																	1	16
Agusan	4	2		1																												1			1			1				1	11
Albay	7	3						1	1	1					4	4	3	1	1			1	2		5													3		2			39
Antique	2	2									2				1				1						2																		10
Bataan	3	5		1					1						4										1													2	1				18
Batangas	11	3	1	1			1	1		1	2		1		7	4	1		1				1	2	1			2						1				2		1		5	50
Benguet	9	15	2	1						1					1	1		2		1		2	4	7	3	1	1											1				3	55
Bohol	5	3								4					6		1					6	1	1	5				1				2		1						1	2	39
Bukidnon	2	2		1																																							5
Bulacan	3	3	2	2											4									2	3						1		1										21
Cagayan	5	3		1						3					8	1	1							2												1		1	1			1	28
Camarines Norte	3	3	1			1									3	4	2								1						1	2						2					23
Camarines Sur	8	3	1	1				1		1			1		3	1	1			1				1														2					25
Capiz	1	2	1	1											5									1											2			1					14
Cavite	8	6		1											5							1			5													3	1			1	31
Cebu	2	2	1	3			1			4					9				1	1	1			2	1										1							1	30
Cotabato	1	3					1															1		1											1			2		1	1	1	13
Davao	8	5	1				1			1					6	1			5	1		2												3				3			1	1	39
Ilocos Norte	8	2		2			1				1				3	4	1		4					1	1							15										1	44
Ilocos Sur	5	4		1										1	1		1					2		1	1													6					23
Iloilo	11	3	1								1				3	2								5	3									2	2						1	2	36
Isabela	4	3		1						2					5	2								1														1					19
Laguna	4	2				1									3				1			2		2	5																		20
Lanao	1	3									1				2	1	3	1						3		1							3		2			2		1			24
La Union	4	5	2								1				6	1	1		2			2			1	1												1	1			1	29
Leyte	5	2	3				1			1					5						1	1			2										1							4	26
Manila																			2			45													4							3	54
Marinduque	2	8								1					1																			2									14
Masbate	3	2		1											3		1															1						3					14
Mindoro	3	4						1				1			6	1				1		2		1	1							1					1	1				1	25
Misamis	2	3	2						1	2	1			1	5	1					1	1		1	3										1			1				3	29
Mountain Province	2	5							1	1								1	1		1			5	1	1	1												1		1		22
Nueva Ecija	14	5		1						2					5		2		1			1		1	3	1												10			1		47
Nueva Vizcaya	2	6					1								1				1		1	1		1														1	1				16
Occidental Negros	14	2		2											9		2		2			2												1				1				1	36
Oriental Negros	5	6					1								5		1								4									1	1								24
Palawan	8	6	1						1						11	2			1					4		2									1								37
Pampanga	3	4								1					3										1													2					14
Pangasinan	11	3		3						2	1				12	6	3		1						2			1														2	47
Rizal	8	4		2		1				2					4	3			1					1														1			1	2	30
Romblon	2	1										1			4	3						1																4					16
Samar	7	3													3							1		1											1			1				1	18
Sorsogon	3	3								1					8								1																				16
Sulu	7	3	3														2						4												4		3	1					27
Surigao	2	2	1												3								1								1				1			1					12
Tarlac	7	2								1							1					2																				1	14
Tayabas	7	3	1					1		3	1				8						1	2	1	1	3	1												2				8	43
Zambales	6	3													2										1							1										1	14
Zamboanga	5	5									I											1		2	1									1	1		4	1					22
Total	250	175	24	28	0	3	8	5	5	35	12	2	2	3	191	42	27	5	26	5	6	80	15	51	61	8	2	3	1	0	3	21	6	11	25	1	8	63	6	5	7	48	1,279

NOTE.—Under the heading "Unclassified" are included such other projects not embraced by any of the above classifications. Of the 48 projects under this caption, there are 13 telephone lines, 19 parks, ground and athletic fields, 7 water tanks, 3 fences for schools and presidencias, 2 lighthouses, etc.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1927]

A. D. WILLIAMS, ***Director of Public Works***
MARCIAL KASILAG, ***Chief Constructing Engineer***
W. J. GRODSKE, ***Chief Designing Engineer***
A. D. WILLIAMS, ***Chief Irrigation Engineer***
C. MANDELBAUM, ***Acting Chief, Division of Architecture***

CENTRAL OFFICE ORGANIZATION

ADMINISTRATIVE DIVISION

Rosendo Reinoso, Chief, Administrative Division and Chief Accountant.
Ramon Roque, Assistant Accountant.
Francisco Cruz, Chief Clerk.
T. Camu, Cashier and Disbursing Officer.
Primo Villar, Law Clerk.
Filomeno Sta. Ana, Record Clerk.
Jose de Jesus, Property Clerk.
Salustiano Reyes, Superintendent of Automobiles.

DESIGNING DIVISION

J. C. Cookingham, Supervising C. E.
L. L. Vincent, Supervising E. and M. E.
Juan Piedad, C. E.
D. Guanio, C. E.
S. Segui, C. E.
A. Villanueva, C. E.
V. A. Gloria, C. E.
M. I. Felizardo, E. and M. E.
C. Coronel, E. and M. E.
A. Pasos, M. E.
V. Villanueva, Asst. E. E.
P. Ilagan, Asst. E. E.
C. Ventura, Asst. E. E.

DIVISION OF ARCHITECTURE

Tomas Mapúa, Supervising Architect.
Juan M. Arellano, Supervising Architect (Pensionado in U. S.)
Antonio Toledo, Acting Supervising Architect.
Antonio M. Tayzon, C. E.
Teodato Macabulos, C. E.
Gonzalo T. Vales, C. E.

DIVISION OF ARCHITECTURE—Cont.

V. Fernandez Lavadia, C. E.
Sancho B. de Leon, C. E.
A. Fernandez de Castro, Asst. C. E.
Antonio M. Paterno, Asst. C. E.
Ephraim G. Gochangco, Asst. C. E.
Juan O. Altiveros, Architect.
Fernando H. Ocampo, Architect.

CONSTRUCTING DIVISION

Melecio Arranz, Div. E., First Division.
E. D. Smith, Div. E., Second Division.
Luis Francisco, Div. E., Third Division.
Vicente Fragante, Div. E., Fourth Division.
Valeriano Segura, Div. E., Fifth Division.
(Vacant) Div. E., Sixth Division.
Mamerto Cruz, Highway Engineer, C. E.
A. T. Sylvester, C. E., Constructing Engineer.
Jose Wright, C. E., Superintendent, Maintenance, Alteration and Repair.
Gregorio Alcantara, C. E.
Rafael Contreras, Asst. C. E.
Gregorio Matanguihan, Asst. C. E.
H. Franco, Chief Electrician.
V. Castillo, Superintendent of Dredges.
F. W. McCaw, Superintendent of Artesian Wells.

IRRIGATION DIVISION

Nicanor Cortes, Designing Engineer.
Hilario S. Clemente, Designing Engineer.
W. J. Lamon, Project Engineer.
H. O. Bauman, Project Engineer.
Leon Ines, Project Engineer.
Gonzalo Garcia, Project Engineer.
Gaudioso Cruel, Project Engineer.

IRRIGATION DIVISION—Cont.

Manuel Gonzales, C. E.
Gregorio de Leon, C. E.
Deogracias de la Paz, C. E.
Graciano J. Militante, C. E.
Miguel Y. Garcia, C. E.
Julian Buendia, C. E. (Pensionado in U. S.).
Alfredo G. Eugenio, C. E.
Jose O. Lahoz, C. E.
Crisostomo Almajose, Supt. of Irrig. Systems.
Fernando Arnaldo, Supt. of Irig. Systems.
Ramon C. Caluya, Supt. of Irrig. Systems.
Procopio Eleazar, Asst. C. E. (Pensionado in U. S.).
Vicente R. Cruz, Asst. C. E.
Faustino Salvador, Asst. C. E.
Bartolome Puzon, Asst. C. E.
Nicolas Jimenez, Asst. C. E.
Felipe R. Jimenez, Asst. C. E.
Agapito Alano, Asst. C. E.
Eleuterio Macalalag, Asst. C. E.
Albert L. Morrow, Asst. C. E.
Filemon Rodriguez, Asst. C. E.
Filemon Zablan, Asst. C. E.
Servando Suguitan, Asst. C. E.
Jacinto Gochoco, Chief Hydrographer.
Wilfred Demers, Supervising Hydrographer.
Arturo Pancho, Hydrographer.
Manuel V. Trani, Asst. Hydrographer.
Roberto Villatuya, Hydrographer.
Tomas Zita, Asst. Hydrographer.
Hilarion S. Silayan, Agriculturist.
Mariano N. Leones, Supervising Surveyor.
Eliseio M. Panopio, Surveyor.
Artemio Abaya, Chief Water Rights Inspector.
Antonio Villanueva, Asst. Chief Water Rights Inspector.

DISTRICT ORGANIZATION

E. J. Halsema, D. E., Baguio, Benguet.
Irineo M. Santos, C. E., Baguio, Benguet.
R. Custodio, Superintendent of Construction, Baguio, Benguet.
Melecio Arranz, Div. E., Manila.
Ricardo Nostratis, D. E., Ilocos Norte.
Deogracias L. Pablo, Asst. C. E., Ilocos Norte.
Jose S. Alejandrino, Asst. C. E., Ilocos Norte.
Arturo P. Nitorreda, D. E., Ilocos Sur–Abra.
Carlos Cuevas, Asst. C. E., Ilocos Sur–Abra.
Carlos de Leon, Asst. C. E., Ilocos Sur–Abra.
Eulogio Benito, Jr. C. E., Ilocos Sur–Abra.
Angel Martinez, D. E., La Union.
Zacarias Sadueste, Asst. C. E., La Union.
Roque Peredo, Acting D. E., Mountain Province.
Hermenegildo Carpo, Asst. C. E., Mountain Province.
Manuel Diaz, Acting D. E., Cagayan.
Bernabe V. Gregorio, C. E., Cagayan.
Pio Mendoza, Asst. C. E., Cagayan.
Manuel Feliciano, Asst. C. E., Cagayan.
Vicente B. Oledan, Acting D. E., Nueva Vizcaya.
Martin Pulido, Asst. C. E., Nueva Vizcaya.
Jose Tomacruz, Asst. C. E., Nueva Vizcaya.
Jaime Laguardia, Acting D. E., Isabela.
Mariano D. Rico, Asst. C. E., Isabela.
Catalino Guillermo, Asst. C. E., Isabela.
E. D. Smith, Div. E., Manila.
Francisco Alvarez, Acting D. E., Rizal.
Segundo Gloria, Asst. C. E., Rizal.
Jose R. Morelos, Asst. C. E., Rizal.
Arsenio V. Caluya, Jr. C. E., Rizal.
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Jose G. Licuanan, Asst. C. E., Cavite.
Fernando E. V. Sison, Acting D. E., Bataan.
Nicolas L. Cuenca, D. E., Zambales.
Rufino Pimentel, Asst. C. E., Zambales.
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Dominador M. Cruz, Asst. C. E., Bulacan.
Isabelo Lagniton, D. E., Pampanga.
Simeon Alfonso, Asst. C. E., Pampanga.
Luis Novenario, Asst. C. E., Pampanga.
Vicente Orosa, Acting D. E., Nueva Ecija.
Eladio M. Santos, C. E., Nueva Ecija.
Tomas Lorenzo, Asst. C. E., Nueva Ecija.
Abelardo R. Icasiano, Acting D. E., Tarlac.
Lorenzo J. Samonte, Asst. C. E., Tarlac.
Fidel V. Larracas, D. E., Pangasinan.
Marcial T. Lagunzad, Asst. C. E., Pangasinan.
Ramon Borromeo, Asst. C. E., Pangasinan.
Eduardo de los Santos, Asst. C. E., Pangasinan.
Bonifacio Villanueva, Surveyor, Pangasinan.
Luis Francisco, Div. E., Manila.
Isaias Fernando, D. E., Batangas.
Aurelio N. Cobangbang, C. E., Batangas.
Miguel P. Taña, Asst. C. E., Batangas.
Rosalio Villalon, D. E., Laguna.
Alfonso Ungson, Asst. C. E., Laguna.
Agapito C. Tuason, Asst. M. E., Laguna.
Jose V. Bagtas, D. E., Tayabas.
Antonio A. Fajardo, Asst. C. E., Tayabas.
Fil de Peralta, Asst. C. E., Tayabas.
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Homobono H. Gonzalez, D. E., Camarines Sur.
Dominador Ermitaño, Asst. C. E., Camarines Sur.
Pedro Lorenzo, Surveyor, Camarines Sur.
Dalmacio Urtula, D. E., Albay.
Francisco Katigbak, C. E., Albay.
Arturo M. Gonzalez, Asst. C. E., Albay.
Antonio R. Soriano, Asst. C. E., Albay.
Sergio Bayan, Acting D. E., Sorsogon.
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Mariano F. Chiyuto, Asst. C. E., Iloilo.
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Florentino Segovia, Asst. C. E., Capiz.
Carlos Amoranto, Asst. C. E., Capiz.
Hospicio I. Fernandez, D. E., Antique.
Filomeno Piczon, Acting D. E., Romblon.
Severino Fernandez, D. E., Occ. Negros.
Jose Gandionco, Asst. C. E., Occ. Negros.
H. E. Fernandez. Asst. C. E., Occ. Negros.
Angel Pascual, Asst. C. E., Occ. Negros.
Pedro Olympia, Asst. C. E., Occ. Negros.
Jose Lozada, D. E., Zamboanga.
Manuel T. Tubungbanua, Asst. C. E., Zamboanga.
Sergio Palencia, Jr. C. E., Zambonaga.
Rufino Garcia, Acting D. E., Cotabato.
Severino D. Pineda, Asst. C. E., Cotabato.
Leandro Espejo, Asst. C. E., Cotabato.
Alfonso Oboza, Acting D. E., Davao.
Jose Viacrucis, Asst. C. E., Davao.
Francisco Fabros, Asst. C. E., Davao.
W. J. Hollis, Acting D. E., Sulu.
Valeriano Segura, Div. E., Manila.
H. C. Garretson, D. E., Cebu.
Teodoro Mocorro, Asst. C. E., Cebu.
Conrado S. Gomez, Asst. C. E., Cebu.
Bernardino P. Pajares, Jr. M. E., Cebu.
Jose Follosco, Acting D. E., Bohol.
Julio A. Reyes, Asst. C. E., Bohol.
Domingo See, Asst. C. E., Bohol.
Roy N. Allen, Acting D. E., Leyte.
Pedro M. Lladoc, Asst. C. E., Leyte.
Joaquin L. Panis, Asst. C. E., Leyte.
Pastor Avisado, Acting D. E., Samar.
Liborio Urtizberia, Asst. C. E., Samar.
Bonifacio Salas, Asst. C. E., Samar.
Ciriaco P. Rama, Surveyor, Samar.
Ambrosio Osmeña, Acting D. E., Oriental Negros.
Juan G. Paraiso, Asst. C. E., Oriental Negros.
Antonio Piñero, Asst. C. E., Oriental Negros.
Jose Ignacio, Acting D. E., Masbate.
Alejandro Rivera, Acting D. E., Lanao.
Lorenzo Ortiz, Acting D. E., Misamis–Bukidnon.
Dionisio Escobar, Asst. C. E., Misamis–Bukidnon.
Felino Brillantes, Asst. C. E., Misamis–Bukidnon.
Marcelo Operario, Jr. C. E., Surigao.
Pedro Formilleza, Asst. C. E., Surigao.
Hilario D. Pulido, Acting D. E., Agusan.

LEGEND

Div. E. = Division Engineer.
C. E. = Civil Engineer.
D. E. = District Engineer.
Asst. C. E. = Assistant Civil Engineer.
Asst. M. E. = Assistant Mechanical Engineer.
Jr. C. E. = Junior Civil Engineer.
Jr. M. E. = Junior Mechanical Engineer.
Supt. = Superintendent.

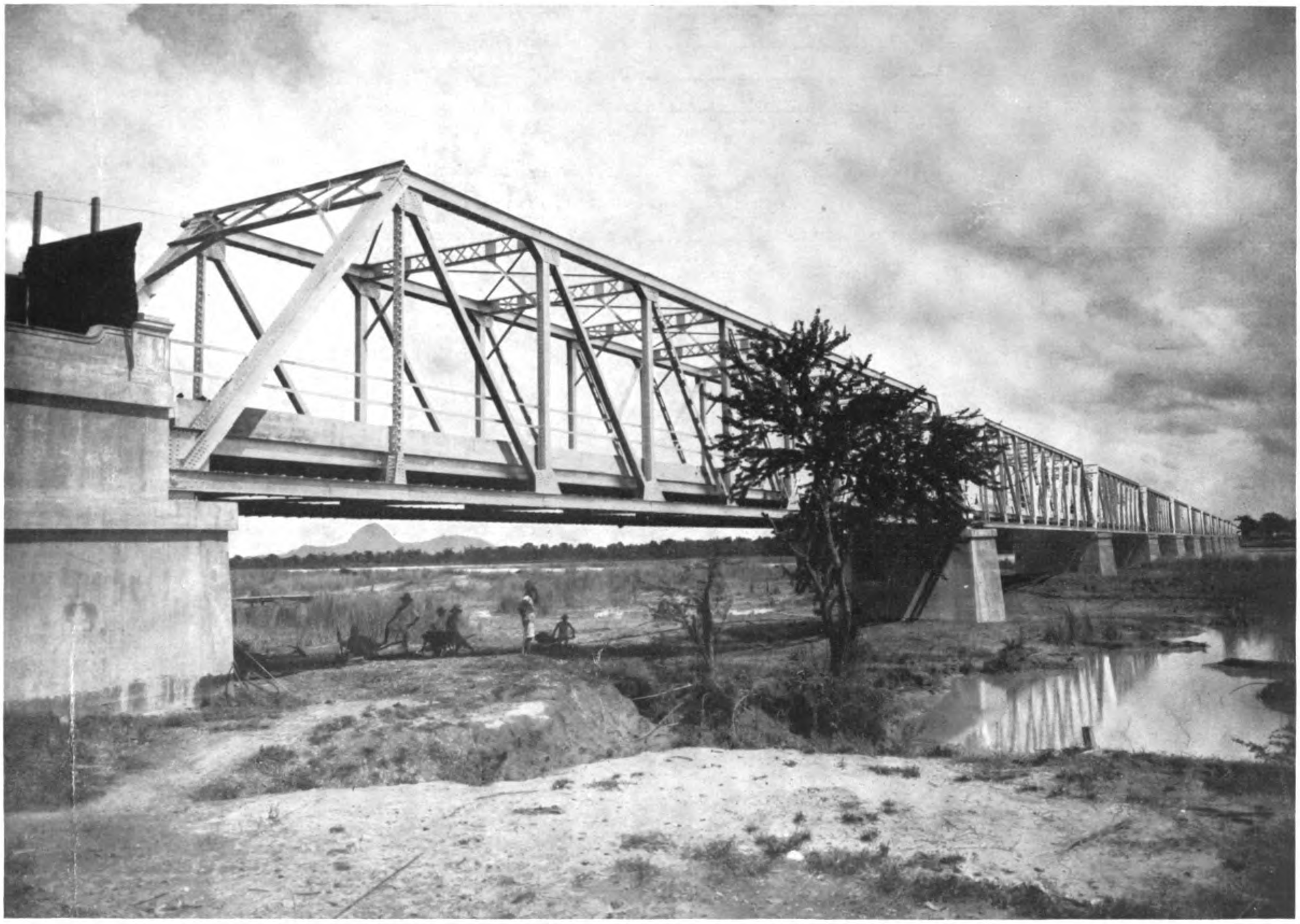
THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS

FEB 8 19

BULLETIN

Vol. 16 JANUARY 1, 1928 No. 1



237622

AGNO BRIDGE, KM. 192.24, MANILA NORTH ROAD

CONVERSION TABLE

One peso (₱) = **50 cents, U. S. currency.**

One kilometer (km.) = **0.62 mile.**

One kilogram (kg.) = **2.20 pounds (lbs.).**

One centimeter (cm.) = **0.39 inch.**

One meter (m.) = **3.28 feet.**

One hectare = **2.47 acres.**

One cubic meter (cu. m.) = **1.31 cubic yards.**

One hectare meter per day = **8.107 acre feet per day.**

One liter per second (second liter) = **0.0353 cubic feet per second (cu. sec.) second feet.**

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1927

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, *March 9, 1928*

SIR: I have the honor to submit herewith the Report of the Bureau of Public Works for the Fiscal Year ending December 31, 1927. During the absence of the undersigned on leave in the United States from February 16 to September 21, 1927, Mr. A. T. Sylvester, Constructing Engineer, was acting Director of the Bureau.

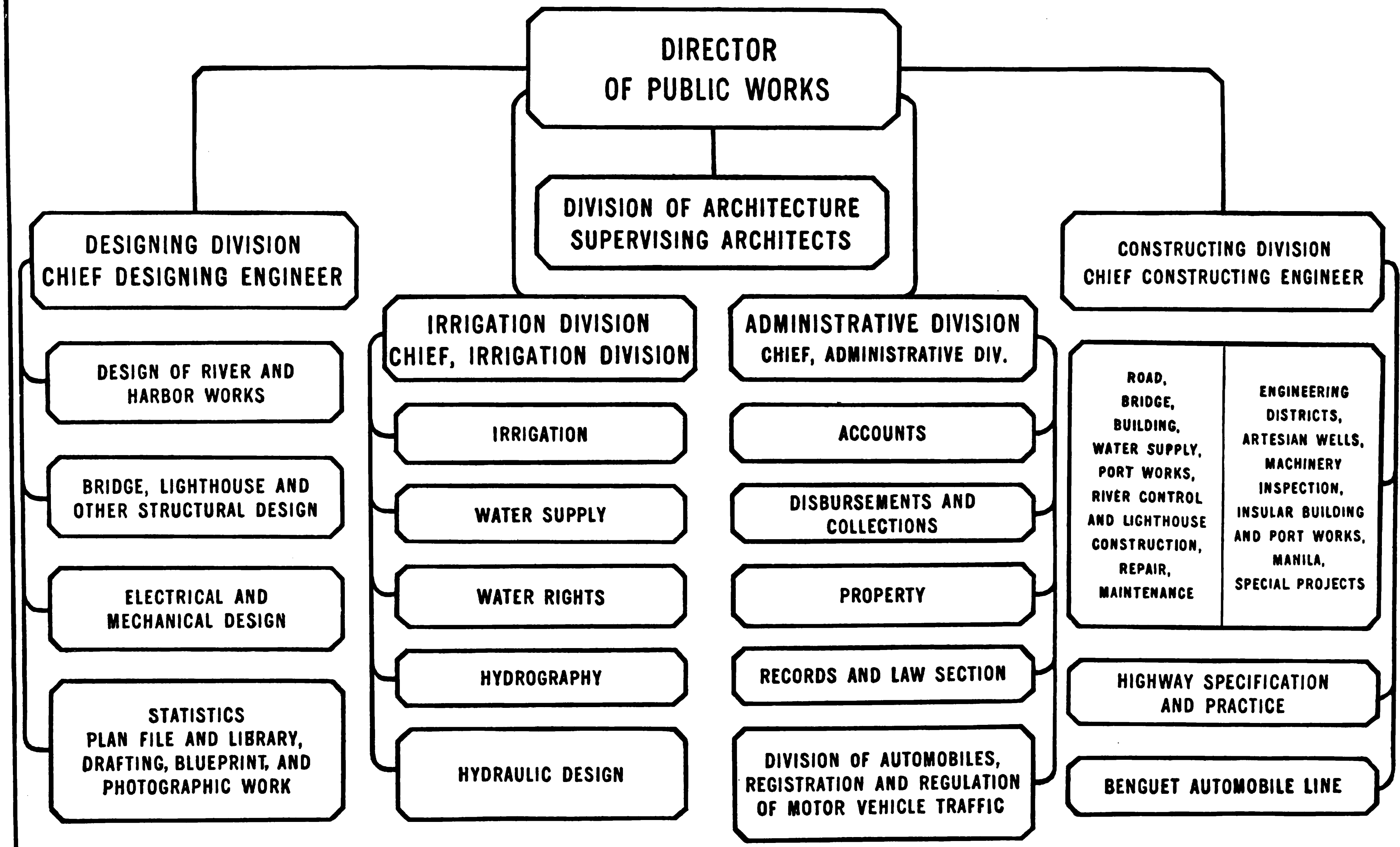
Very respectfully,

A. D. WILLIAMS
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1927


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS PLAN FILE AND LIBRARY, DRAFTING, BLUEPRINT, AND PHOTOGRAPHIC WORK
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
ADMINISTRATIVE DIVISION CHIEF, ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE

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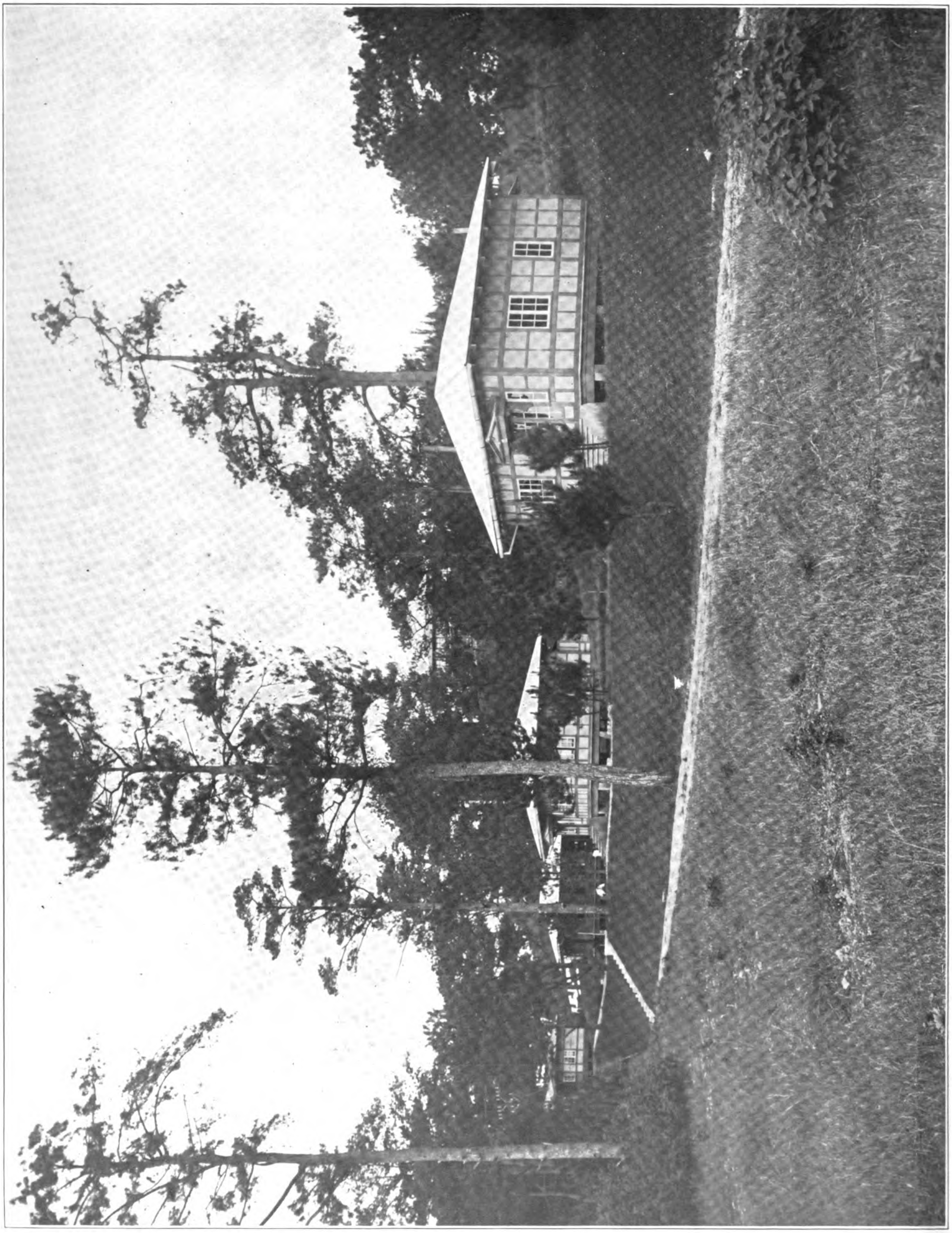


NEW GOVERNMENT COTTAGES, BAGUIO, BENGUET

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and principal functions of the Bureau of Public Works are shown in the organization diagram on page four. The Philippine Islands are now divided into forty-seven (47) engineering districts which, with the exception of a separate district for the City of Manila, are coextensive with provincial limits. The district engineer is the local representative of the Bureau in each district and is responsible for all activities, excepting the larger irrigation projects, which are constructed by project engineers under the direct supervision of the Manila Office. The Central Office in Manila prepares plans and specifications for construction projects and exercises general supervision over all activities of the Bureau.

PERSONNEL

Number of employees paid direct from Bureau and project funds as of December 31, 1927: Americans, 18; Filipinos, 362.

[NOTE.—The corresponding figures for December 31, 1926, are: Americans, 19; Filipinos, 362, respectively]

Number of technical employees as of December 31, 1927: Americans, 10; Filipinos, 210.

[NOTE.—The corresponding figures for December 31, 1926, are 14 and 189, respectively]

American Technical Employees

Position	Permanent	Temporary	Total
Civil engineer	7	0	7
Electrical and mechanical engineer	1	0	1
Surveyor	1	0	1
Architect	1	0	1
Total	10	0	10

Filipino Technical Employees

Position	Permanent	Temporary	Total
Civil engineer	51	17	68
Assistant civil engineer	103	13	116
Junior civil engineer	1	1	2
Mechanical engineer	2	0	2
Mechanical and electrical engineer	2	0	2
Assistant mechanical engineer	2	1	3
Electrical engineer	2	0	2
Assistant electrical engineer	2	0	2
Junior mechanical engineer	0	1	1
Surveyor	5	0	5
Junior surveyor	2	0	2
Architect	2	0	2
Supervising architect	2	0	2
Agriculturist	1	0	1
Total	177	33	210

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau by whatever branch of the Government paid:

Changes	Americans	Filipinos	Total 1927	Total 1926
Number of appointments	0	186	186	217
Number of transfers to Bureau	0	3	3	9
Number of separations for cause	0	6	6	6
Number of voluntary resignations	0	89	89	111
Number of transfers from Bureau	0	7	7	5
Number of retirements	0	2	2	7
Number of separations due to expiration of employment	0	2	2	5
Number of deaths	0	8	8	5

NOTE.—Item "Number of appointments" includes new and probational appointments.

The activities of the Bureau during 1927 were materially increased on account of the amount of increased appropriations provided for public works. The results obtained during the year are set forth in detail in the following report and tabulations:

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1926 AND 1927

Items	Insular expenditures				Provincial and municipal expenditures		Fund from private sources		Total	
	Bureau of Public Works		Appropriations controlled by other Bureaus							
	1926	1927	1926	1927	1926	1927	1926	1927	1926	1927
	Pesos	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*
Roads and bridges	126,857.80	124,304.86	15,431.88	38,455.14	9,078,239.43	11,912,539.80			9,220,529.11	12,075,299.80
Telegraph, telephone and cable lines	438,830.48	325,501.87	2,616.00		23,444.73	28,770.96			464,891.21	354,272.83
Buildings	441,261.03	946,384.13	1,062,969.66	23,590.16	2,904,836.78	3,798,613.35			4,409,067.47	4,768,587.64
Wireless station buildings including towers and masts	48,142.72	33,910.70	210.20	1,575.73					48,352.92	35,486.43
Maintenance, alteration, and repair of public buildings	351,373.77	455,531.89	5,811.31	815.62	208,186.29	168,176.40	2,233.20		567,604.57	624,523.91
River and harbor works (including lighthouses, buoys, and beacons)	1,653,831.17	2,081,060.68	1,322,957.79	919,028.47	73,620.70	116,699.60	13,562.09	20,436.91	3,063,971.75	3,137,225.66
Artesian wells and water supply	254,291.31	293,304.51	17,944.11	6,436.59	634,153.81	1,512,963.59	17,242.67	11,324.51	923,631.90	1,824,029.20
Irrigation projects	169,411.02	126,283.97	2,246,970.69	1,590,190.84	572.76	1,713.69	136,768.15	167,832.68	2,553,722.62	1,886.021.18
Benguet automobile line	85,000.00	130,380.23							85,000.00	130,380.23
Registration and regulation of motor vehicle traffic	62,555.35	83,040.00							62,555.35	83,040.00
Los Baños quarry	110,000.00	140,000.00							110,000.00	140,000.00
Board of examiners for engineers and architects	2,000.00	3,800.00							2,000.00	3,800.00
Regulation, safeguarding of traffic and collection of tolls on Kennon and Naguilian Roads	9,000.00	12,000.00							9,000.00	12,000.00
Dwellings and equipment for rent in Baguio		37,664.51								37,664.51
Miscellaneous			163,349.52	169,090.46	255,616.12	344,104.80	2,696.40	3,473.80	421,662.04	516,669.06
Total	3,752,554.65	4,793,167.35	4,838,261.16	2,749,183.01	13,178,670.62	17,883,582.19	172,502.51	203,067.90	21,941,988.94	25,629,000.45

BALANCE SHEET, BUREAU OF PUBLIC WORKS

Assets	1926	1927
Current:		
Cash, collecting and disbursing officer	₱1,632,830.50	₱2,029,463.73
Cash (deposit), Insular Treasury	1,099,935.22	1,709,213.15
Accounts receivable	2,603,068.89	2,789,696.15
Supplies and materials	687,026.43	497,378.37
Prepayments	12,392.95	3,610.97
Investment:		
Loan to municipality of Antipolo	4,000.00	
Work in process		2,254.41
Total current assets	6,039,253.99	7,031,616.78
Fixed property:		
Real property and improvements	45,178,646.33	47,085,938.63
Equipment	4,529,403.76	4,590,245.34
(Less depreciation)	(671,462.43)	(941,975.00)
Total assets	55,075,841.65	57,765,825.75

Liabilities	1926	1927
Fixed property—Continued.		
Accounts payable	₱1,658,974.83	₱2,008,935.86
Accrued leave payable	208,300.75	211,935.31
Undistributed collections	10,960.40	47,937.03
Deferred credit to income	5,421.23	1,141.78
Fiduciary fund	19,224.41	44,060.39
Insurance reserve	28,052.55	27,937.33
Balances of appropriations:		
Dwellings and equipment for rent, Baguio	40,984.17	51,807.04
Motor vehicle special fund, Act 3045	43,731.52	111,060.86
Benguet auto line	123,148.74	168,019.04
Construction of buildings, etc	528,348.32	1,051,339.77
Maintenance, alteration, and repair of public buildings	158,151.36	152,619.47
Irrigation system	21,655.89	25,371.92
Artesian wells and waterworks	14,403.02	102,098.51
Harbor and river improvement	844,183.00	1,299,699.59
Highway special fund (revenue from gasoline and lubricating oil) Act 3248	1,709,145.80	1,060,826.16
Roads and bridges	19,426.65	11,121.79
Telephone, telegraph, cable, etc	354,859.15	526,000.00
Lighthouse, buoys, and beacons	250,282.20	129,704.93
Total current liabilities	6,039,253.99	7,031,616.78
Principal account surplus:		
Fixed property investment	49,036,587.66	50,734,208.97
Total liabilities	55,075,841.65	57,765,825.75

STATEMENT OF APPROPRIATION, INCOME AND EXPENSES

Debit	1926	1927
Reversion of unexpended balances of administrative appropriation	₱13,248.70	₱20,103.79
Reversion of receipts	989,958.92	1,066,078.82
Operating expenditures offset by receipts	8,501,337.88	7,068,685.94
Expenditures, administrative appropriation	911,218.27	913,586.21
Outlays, purchase of equipment	4,679.25	8,580.00
Total debit	10,420,443.02	9,077,034.76

Credit	1926	1927
Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱929,146.22	₱942,270.00
Receipts—prime cost	8,501,337.88	7,068,685.94
Receipts—surcharges	857,032.28	992,786.81
Receipts—miscellaneous	56,353.79	13,528.41
Gain on supplies sold	2,065.02	1,088.08
Inventory adjustments	4,135.57	2,252.42
Income from rentals, equipment	16,315.54	16,967.77
Sales of fixed assets	2,280.34	3,498.00
Prior year's credit	51,776.38	35,957.33
Total	10,420,443.02	9,077,034.67

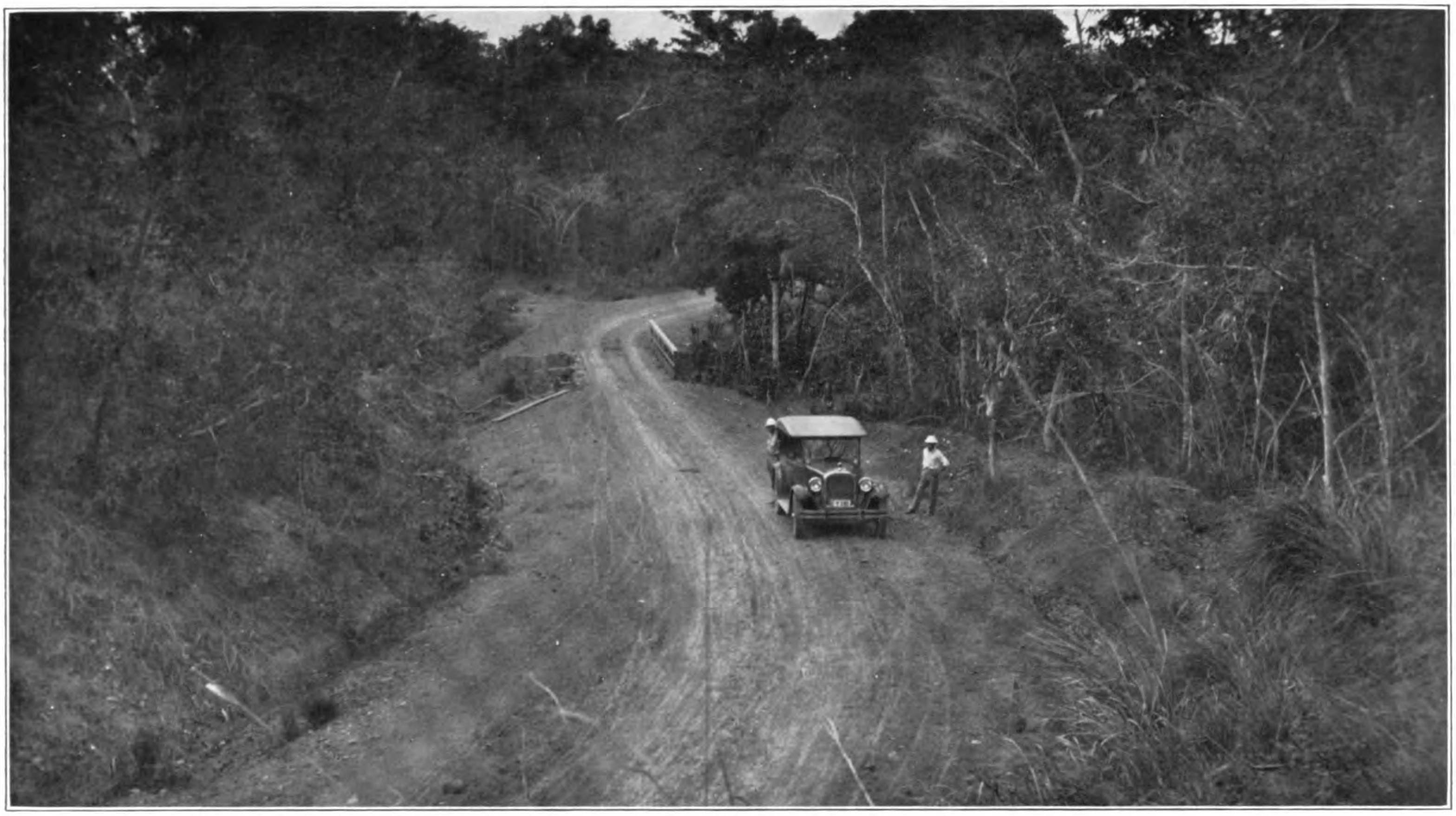
OPERATION STATEMENT, BUREAU OF PUBLIC WORKS

Operating revenue	1926	1927
Rental	₱16,315.54	₱16,967.77
Surcharges	857,032.28	992,786.81
Gain on goods sold	2,065.02	1,088.08
Inventory adjustments	4,135.57	2,252.42
Sales of fixed assets	2,280.34	3,498.00
Other service income	56,353.79	13,528.41
Prior year's credit	51,776.38	35,957.33
Total	989,958.92	1,066,078.82

Operating expenses	1926	1927
Supervising, technical and clerical services (salaries)	₱738,388.05	₱750,170.11
Labor	47,104.00	50,488.66
Consumption of supplies and materials	42,500.00	42,000.00
Rental of buildings	24,000.00	22,666.65
Illumination and power service	8,600.00	8,000.00
Traveling expenses of personnel	23,000.00	19,000.00
Repair service	8,500.00	5,000.00
Postal, telegraph, telephone, and cable service	11,620.00	8,320.00
Other expenses	7,506.22	7,940.79
Total operating expenses	911,218.27	913,586.21
Operating profit	78,740.65	152,492.61
Total	989,958.92	1,066,078.82

SPECIAL APPROPRIATIONS

Name of activity	Appropriation		Expenditures		Reversion of appropriation		Income	
	Act 3217	Act 3340						
	1926	1927	1926	1927	1926	1927	1926	1927
1. Registration and regulation of motor vehicles	₱ 64,500.00	₱ 83,040.00	₱ 62,555.35	₱ 83,040.00	₱ 1,944.65		₱ 985,051.28	₱ 1,145,369.34
2. Regulation and safeguarding of traffic and collection of tolls	9,000.00	12,000.00	9,000.00	12,000.00			45,479.98	41,220.75
3. Benguet auto line	85,000.00	163,343.00	85,000.00	130,380.23		₱ 32,962.77	123,148.74	175,250.53
4. Los Baños Quarry	110,000.00	140,000.00	110,000.00	140,000.00			66,274.15	46,788.90
5. Board of Examiners for Engineers and Architects	2,000.00	3,800.00	2,000.00				1,910.00	2,460.00
6. Baguio dwellings and equipment for rent		40,915.00		37,664.51		3,250.49		48,487.38
Totals	270,500.00	443,098.00	268,555.35	406,884.74	1,944.65	36,213.26	1,221,864.15	1,459,576.90



Cabanatuan–Bongabong Road, under construction, Nueva Ecija

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) TO DECEMBER 1927

Assets	1926	1927	Liabilities	1926	1927
1. Principal account surplus from previous year	₱46,474,807.65	₱48,919,153.07	1. Equipment sold	₱2,278.12	₱3,516.46
2. Purchase of equipment	347,343.90	117,291.00	2. Equipment condemned on Insular inventory report, dropped on affidavits, undersold, etc	117,434.59	220,846.04
3. Fixed property brought into account	1,137,783.84	2,257,917.80	3. Equipment dropped by transfer to provinces and municipalities	20,752.02	211,503.48
4. Equipment acquired by transfer	5,656.00	580,773.53	4. Equipment and fixed assets dropped by transfer to other bureaus, etc	23,721.85	1,365,635.72
5. Inventory adjustment	....	66.37	5. Inventory adjustment	31,556.93	199.00
6. Equipment found at station including worn out tires taken into account	1,149,232.05	650,709.98			
7. Equipment acquired by construction	73.14	9,997.92	6. Principal account surplus, December 31	48,919,153.07	50,734,208.97
Total debits	49,114,896.58	52,535,909.67	Total liabilities	49,114,896.58	52,535,909.67

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first class	kms	187.2
Reinforced concrete bridges and culverts completed (in this figure, concrete pipe culverts are not included)	number	48
Successful deep wells completed	number	124
Reinforced concrete buildings completed—including only buildings of over 100 cubic meters capacity	number	106

Expenditures supervised during the year 1927 as compared with the year 1926

Items	1926	1927
Total expenditures	₱21,941,988.94	₱25,629,000.45
Total expended upon road and bridge work	9,220,529.11	12,075,299.80
Total expended upon building work	5,025,024.96	5,428,597.98
Total expended upon port works	3,063,971.75	3,137,225.66
Total expended upon water supply	923,631.90	1,824,029.20
Total expended upon irrigation projects	2,553,722.62	1,886,021.18
Operation of auto line, quarries, and the supervision of motor vehicle traffic	266,555.35	365,420.23
Expenditures on miscellaneous items account for the balance	888,553.25	912,406.40

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year ending December 31, 1927, there were 6,067 motor vehicles newly registered and 21,530 re-registered for operation, or a total of 27,597 motor vehicles, as compared with 23,538 registered during 1926. There were also 1,799 motor vehicles registered for storage. During this same period 15,024 applicants for drivers' licenses were examined and 6,609 new licenses issued. Including renewals, 40,049 operators of motor vehicles were licensed during 1927.

The following is a comparative tabulation of motor vehicles registered during the years 1926 and 1927:

Vehicles	1926	1927
Automobiles	16,239	18,547
Motor trucks	6,541	8,283
Motorcycles	758	767
Total	23,538	27,597

The campaign for the apprehension of violators of the Motor Vehicle Law was carried out more vigorously with the result that there were 2,402 licenses suspended and 101 revoked, as compared with 1,972 licenses suspended and 34 revoked during 1926. The results of the campaign are as follows:

	Total number of cases reported		Reckless driving		Speeding	
	1926	1927	Number	Per cent	Number	Per cent
First quarter	1,178	1,436	167	11.6	160	11.0
Second quarter	1,124	1,059	186	17.3	183	17.0
Third quarter	959	984	241	24.6	79	8.0
Fourth quarter	888	1,359	247	18.0	133	9.8
Total	4,149	4,838	841	....	555	....

	1926	1627
Number of deaths caused by automobile accidents reported during the year	35	40
Number of licenses suspended during the year	1,972	2,402
Number of licenses revoked during the year	34	101
Amount of fines in violation of Auto Law	₱13,847.00	₱14,306.42

Provisions of the Automobile Law (Act 3045) commonly violated:

	1926	1927
Section 20, overloading	1,331	1,370
Section 26–(*h*), reckless driving	859	841
Section 34, light	145	164
Section 14–(*h*), driving without licenses	326	301
Section 26–(*a*), speeding	401	555

COLLECTIONS AND EXPENDITURES

The following tabulation shows the yearly collections and expenditures in connection with the registration and regulations of motor vehicles from 1912 to 1927:

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,392.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	628,918.54	60,000.00
1924	633,214.36	50,000.00
1925	798,438.62	63,025.55
1926	985,051.28	62,555.50
1927	1,145,369.34	83,040.00

THE BENGUET AUTOMOBILE LINE

During the year the Benguet Automobile Line operated three (3) first-class busses, one (1) third-class bus, one (1) passenger and express truck, four (4) express and freight trucks, fourteen (14) special touring cars, one (1) Chevrolet one-ton truck, and one (1) fire truck; and handled 76,632 and 388 half fare first-class passengers; 16,007 and 1,845 half fare third-class passengers; 182,500 kilos of hand baggage; 2,489,685 kilos of express and freight; and 81,888 kilos of dead-head freight and express. In spite of the increased amount of traffic handled, no accidents occurred in connection with the operation of the line.

The operation of the Benguet Automobile Line on a revolving fund, as authorized by the Legislature in 1926, enabled the Bureau to purchase considerable new equipment to replace old cars which were no longer economical to operate. The total receipts of the line for 1927 amounted to ₱175,250.53, as against ₱123,148.74 for the previous year, while the net operating profit was ₱34,913.66, as compared to ₱14,372.29 for the year of 1926.

THE USE OF THE KENNON AND NAGUILIAN ROADS

Both of these Insular roads, leading from the lowlands to Baguio, were maintained in a satisfactory condition and at a very reasonable cost during 1927. The wooden bridges at Kilometer 295.70 on the Kennon Road, and at Kilometer 250 on the Camp One–Damortis Road were replaced with a 61-foot steel pony truss and a 180-foot suspension bridge, respectively. On the Naguilian Road, sharp curves were improved, and split curves provided at many places to further insure the safety of traffic.

The following is a comparative statement of traffic over the Kennon and Naguilian Roads for the past three years:

Kennon Road

Year	Pedestrians	Bull carts	Animals, led	Calesas	Motorcycles	Autos, passenger	Autos, trucks	Wagons
1925	10,743	1,176	159	1	543	7,080	4,439	58
1926	10,004	1,635	....	....	441	8,253	4,655	70
1927	12,142	2,974	175	....	470	9,317	5,890	33

Naguilian Road

Year	Pedestrians	Bull carts	Animals, led	Calesas	Motorcycles	Autos, passenger	Autos, trucks	Wagons
1925	19,893	2,173	516	....	190	9,032	4,164	2,084
1926	26,808	3,062	1,878	6	84	9,734	4,405	2,448
1927	26,765	2,587	2,203	....	34	11,058	7,212	2,422

BAGUIO COTTAGES AND APARTMENTS

The Insular Government cottages and apartments (formerly office buildings) were leased to Government employees and private parties in accordance with the regulations governing same, approved under date of June 23, 1925. There was a greater demand for these accommodations during the past season than ever before in the history of Baguio. The total income from the cottages and apartments during the year amounted to ₱48,487.38, while the cost of maintaining and operating same was ₱28,227.34. The cost of operation and maintenance was charged to the revolving fund created by Act 3340, 1926.

LOS BAÑOS QUARRY

The total appropriation available was ₱140,000. Of this amount approximately ₱58,935.00 was devoted to stone-producing operation and the remainder to the improvement of the entire plant, which has been under way for several years. The hydroelectric plant was completed sufficiently to produce power before the close of the year.

Twin waterwheels and generator sets, each with a rated capacity of 165 kva. were installed, with suitable synchronizing equipment, switchboard, etc. Power is produced at 2,300 volts and can be stepped-down to the proper voltage for quarry-operation, or commercial lighting, etc., as desired. The actual capacity of the plant, operating under a 1,100-foot head, will depend upon the seasonal fluctuation of the water supply. A minimum of 60 kilowatts can be assured under the worst conditions heretofore known, while the output for fully three-fourths of the year should be over 100 kilowatts. A reservoir capable of storing one-day's minimum flow is being constructed at the source to carry over the deficiency of water during the normal period of maximum demand. In addition, the crude-oil set will be kept as a stand-bye to assist in the minimum flow period, in case of need.

At the close of the year there still remained considerable work to be done to place the new quarry plant in commission. The principal items are the construction of bins and the extension of the railroad to the new crusher plant. This work is being pushed vigorously to permit the use of the new plant in filling the customary dry-season orders for rock.

During the year 1927 the quarry produced and sold 18,750 cubic meters of crushed stone of all classes, which returned a revenue of ₱45,273.

Arrangements were in progress at the close of the year to furnish light and power to the College of Agriculture at Los Baños.

AIDS TO NAVIGATION

Maintenance and improvement of aids to navigation was again delegated by the Department Secretary to the Bureau of Commerce and Industry. The total appropriation available was ₱225,000.

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Chief Constructing Engineer*

ROADS

The large increase in the amount of funds set aside for road purposes during 1927 enabled this Division to carry out an active program for improving existing roads and for new construction. It will be noted from the following table that there was an increase in revenue from the usual sources; that ₱2,926,098.38 accrued under Act 3248 (Gasoline Tax Law) and was available for expenditure for the first time, and that the total increase in funds over those available for 1926 amounted to approximately ₱6,000,000. Of the funds that accrued under Acts 3045 and 3248, ₱2,400,000 were released during October and December, and, for the most part, remained unexpended at the end of the year.

In addition to the funds shown in Table I, ₱472,884 were provided by the Province of Pangasinan and ₱370,000 by the Province of Occidental Negros from the sale of provincial bonds for the construction of important bridge projects. The necessary steps were also taken during the year to sell bonds totalling ₱718,000 for financing the construction of permanent bridges in Laguna, Tarlac, Bulacan, and La Union Provinces.

A total of 187.2 kilometers of first-class road and 420.8 kilometers of second-class road were constructed during 1927, making the total kilometerage of improved roads in the Islands 9,065.8. There was also a large kilometerage of subgrade work completed and under way at the end of the year.

While the average cost of maintaining first and second-class roads was only slightly greater than during the previous year, it has become evident on roads subjected to very heavy motor vehicle traffic that water-bound macadam surfacing is inadequate and expensive to maintain. The construction of hard surface pavements would be the proper solution of this problem, but on account of the limited amount of funds provided and the policy of making available the largest possible kilometerage of road as quickly as possible, work has been confined thus far to the construction of short experimental sections of such pavements. During 1927, 7.69 kilometers of asphalt pavement and one (1) kilometer of concrete pavement were constructed in the provinces of Rizal and Iloilo, which makes a total of 28 kilometers of asphalt pavement and 3.8 kilometers of concrete pavement constructed. These new types of pavement not only reduce maintenance cost and eliminate the dust nuisance, but materially lower the cost of travel for the public.

The accompanying tables show the total amount of funds provided for road and bridge purposes, the amounts expended for maintenance and construction, the cost of road maintenance in each province and the average cost of maintaining the different classes of roads during the year:

TABLE I.—*Funds for road construction and maintenance*

Year	General taxation (provincial road and bridge funds)	Act 3045 (automobile registration and license fees)	Insular appropriation	Act 3240, levying a special tax on motor spirits	Total
1922	₱4,469,555.00	₱518,825.85	₱3,245,000.00	....	₱8,233,380.00
1923	3,999,756.00	628,918.54	2,380,000.00	....	7,008,674.54
1924	4,326,878.00	633,214.36	2,400,000.00	....	7,360,092.36
1925	4,406,320.00	798,438.62	2,517,327.00	....	7,722,085.62
1926	5,871,384.99	985,051.28	2,705,000.00	....	9,561,436.27
1927	7,476,690.83	1,145,369.34	4,436,500.00	₱2,926,098.38	15,984,658.55

TABLE II.—*Amount expended for road construction and maintenance*

Year	Maintenance	Construction	Total
1922	₱5,050,554.19	₱2,197,565.64	₱7,248,119.83
1923	5,356,230.19	2,007,147.73	7,363,377.92
1924	5,693,466.40	2,619,316.68	8,312,783.08
1925	5,873,078.63	3,545,890.66	9,418,969.29
1926	5,806,013.33	3,689,750.14	9,495,763.47
1927	6,525,639.46	6,006,544.21	12,532,183.67

TABLE III.—*Maintenance of first, second, and third-class roads*

Province	First class			Second and third-class roads			Trails
	Length of first-class roads	Total expenditures for maintenance of first-class roads	Average cost per kilometer of maintenance	Length of second and third-class roads	Total expenditures for maintenance of second and third-class roads	Average cost per kilometer of maintenance	Total expenditures
Abra	64.4	₱28,178.43	₱437.50	38.0	₱8,426.05	₱221.90	
Agusan				50.8	21,465.11	422.50	
Albay	217.8	145,034.40	659.59	65.0	14,472.09	222.60	
Antique	108.8	59,421.30	546.10	122.0	36,192.69	296.60	
Bataan	41.3	44,687.87	1,082.00	23.6	1,877.56	79.60	₱484.25
Batangas	208.5	135,453.89	649.60	179.3	15,787.13	87.90	
Benguet and the City of Baguio	129.4	122,494.90	946.60	151.3	30,001.03	198.20	30,001.03
Bohol	249.6	120,771.76	483.90	138.4	36,098.38	260.90	
Bukidnon		83,601.84		147.4	39,306.95	266.60	
Bulacan	116.3	174,950.00	1,504.30	202.4	60,670.73	299.70	
Cagayan	74.0	43,536.99	589.40	156.2	16,722.63	107.00	
Camarines Norte	34.3	45,501.19	1,326.50	27.2	4,442.92	163.30	
Camarines Sur	162.0	113,844.34	702.70	93.9	22,327.08	237.50	
Capiz	204.1	172,878.43	847.40	106.4	21,146.41	198.70	
Cavite	99.5	151,721.02	1,514.80	40.1	24,318.00	607.90	
Cebu	337.3	348,947.15	1,035.40	386.6	86,352.26	223.10	
Cotabato	25.3	27,116.57	1,044.60	51.8	11,943.36	229.70	22,673.09
Davao	30.8	53.413.31	1,723.00	61.4	27,741.52	451.80	
Ilocos Norte	91.4	48,028.00	527.70	119.9	39,784.96	331.50	
Ilocos Sur	184.2	136,802.52	743.50	23.8	20,786.14	866.00	
Iloilo	287.1	276,130.48	962.10	215.0	10,405.58	483.50	
Isabela	86.1	57,663.39	670.50	133.3	2,115.38	15.90	
Laguna	161.4	150,293.51	933.50	89.3	23,303.81	261.90	
Lanao	43.4	40,919.64	942.80	58.2	18,903.43	325.90	
La Union	121.1	102.196.68	844.60	56.4	14,452.65	256.20	
Leyte	141.8	237,760.51	1,674.40	169.6	67,693.90	398.20	7,413.11
Marinduque	51.5	19,787.69	379.50	32.9	4,402.97	133.40	
Masbate	44.6	19,506.12	433.50	20.4	92.08	4.60	
Mindoro	55.0	21,620.19	393.10	57.9	14,484.21	149.70	
Misamis	122.0	103,285.00	846.60	172.4	72,618.79	422.20	
Mountain Province				320.6	183,423.91	571.40	44,436.19
Nueva Ecija	208.2	271,016.66	1,302.90	290.6	54,049.88	185.70	
Nueva Vizcaya	66.5	43,156.72	648.90	66.0	9,954.03	150.80	
Occidental Negros	363.9	239,868.38	686.70	148.6	28,319.40	190.00	
Oriental Negros	179.3	110,710.33	618.40	119.5	18,975.82	158.10	
Palawan				65.8	25,456.63	385.70	
Pampanga	203.4	197,619.99	973.50	161.7	12,070.85	74.50	
Pangasinan	499.2	362,475.32	726.40	198.8	25,060.40	125.90	
Rizal	191.6	260,923.69	1,358.90	62.1	7,657.17	123.50	
Romblon				56.2	25,025.98	446.90	
Samar	110.6	69,708.03	628.00	209.7	84,912.09	404.30	
Sorsogon	130.7	78,583.69	599.90	64.2	21,168.91	329.70	
Sulu	26.8	25,744.68	953.50	32.8	23,361.74	707.90	
Surigao	54.3	39,238.29	722.60	28.5	10,265.90	360.20	
Tarlac	161.8	97,470.34	601.60	57.5			
Tayabas	199.6	165,007.95	825.00	114.7	8,740.33	779.30	
Zambales	82.9	35,222.35	424.10	68.6	9,910.62	144.40	
Zamboanga	62.1	54,500.00	879.00	97.9	44,300.00	452.00	
Total	6,033.9	5,048,541.05	836.67	5,354.7	1,372,690.74	256.30	104,407.67

TABLE IV.—*Average cost of maintenance of first and second-class roads*

Year	First class			Second class		
	Total length in kilometers maintained throughout the year	Total cost of maintenance	Average cost per kilometer maintained	Total length in kilometers maintained throughout the year	Total cost of maintenance	Average cost per kilometer maintained
1922	4,854.5	₱4,205,289.25	₱866.27	3,389.4	₱812,581.82	₱239.74
1923	3,014.3	4,367,742.20	871.06	3,535.6	955,440.81	270.23
1924	5,213.0	4,461,035.06	855.75	3,840.3	1,028,547.73	267.83
1925	5,517.6	4,801,567.32	870.23	4,281.8	1,071,511.31	250.25
1926	5,846.7	4,638,873.12	793.33	5,044.2	1,031,788.58	204.55
1927	6,033.9	5,048,541.05	836.70	5,354.7	1,365,033.57	254.90

TABLE V.—*Increase in first-class road kilometerage during the year 1927*

Province	Roads in existence December 31, 1926	Roads in existence December 21, 1927	Increase during the year 1927	Province	Roads in existence December 31, 1926	Roads in existence December 31, 1927	Increase during the year 1927
Abra	64.4	64.4		Leyte	140.0	141.8	1.8
Agusan				Marinduque	51.5	51.5	
Albay	208.2	217.8	9.6	Masbate	36.0	44.6	8.6
Antique	108.8	108.8		Mindoro	40.2	55.0	14.8
Baguio	47.8	57.0	9.2	Misamis	122.0	122.0	
Bataan	38.6	41.3	2.7	Mountain Province			
Batangas	204.5	208.5	4.0	Nueva Ecija	199.3	208.2	9.0
Benguet	72.4	72.4		Nueva Vizcaya	49.8	66.5	16.7
Bohol	244.0	249.6	5.6	Occidental Negros	360.9	363.9	3.0
Bukidnon				Oriental Negros	173.6	179.3	5.7
Bulacan	116.3	116.3		Palawan			
Cagayan	72.8	74.0	1.2	Pampanga	201.1	203.4	2.3
Camarines Norte	34.3	34.3		Pangasinan	489.8	499.2	9.4
Camarines Sur	161.2	162.0	0.8	Rizal	185.5	191.6	6.1
Capiz	201.2	204.1	2.9	Romblon			
Cavite	85.5	99.5	14.0	Samar	108.3	110.6	2.3
Cebu	334.7	337.3	2.6	Sorsogon	118.7	130.7	12.0
Cotabato	22.3	25.3	3.0	Sulu	26.8	26.8	
Davao	29.8	30.8	1.0	Surigao	54.3	54.3	
Ilocos Norte	84.9	91.4	6.5	Tarlac	160.8	161.8	1.0
Ilocos Sur	181.8	184.2	2.4	Tayabas	193.2	199.6	6.4
Iloilo	287.1	287.1		Zambales	68.2	82.9	14.7
Isabela	82.1	86.1	4.0	Zamboanga	62.1	62.1	
Laguna	161.4	161.4					
Lanao	43.5	43.4		Total	5,846.7	6,033.9	187.2
La Union	117.2	121.1	3.9				

First-class roads.—Well graded and surfaced, thoroughly drained, and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

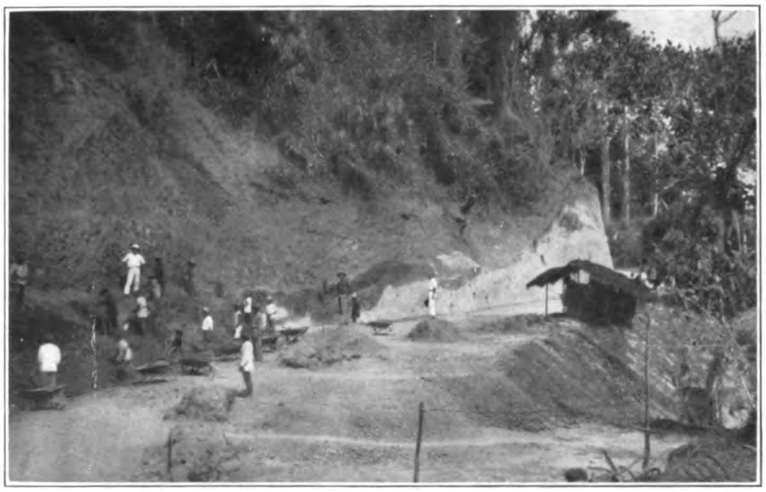
Third-class roads.—All traffic routes for carts not included in the first and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Type of surfacing	December 31, 1926	December 31, 1927
	Kilometers	*Kilometers*
Concrete	2.5	3.8
Asphalt	9.2	28.0
Stone	1,660.1	1,696.8
Gravel	3,899.9	4,127.8
Coral	1,920.2	2,246.6
Unsurfaced	3,446.5	3,285.6
Total	10,938.4	11,388.6

Road construction during the year consisted largely in continuing work on projects under way, the most important of which are the following:

Cagayan Valley Road, Nueva Ecija Province.—The section of this road through the Province of Nueva Ecija is known as the San Jose–Santa Fe Road and is 58 kilometers in length. The work accomplished during the year included the widening of the subgrade between K–193 and K–194, K–195 and K–199, and between K–201 and K–202. This completes the widening of the section from Camp 4, K–167 to K–204, Capintalan. Contract was awarded for widening the section from K–205 to K–211, some parts of which have been completed. The sum of ₱75,164.74 was expended on this project.

Cagayan Valley Road, Nueva Vizcaya Province.—Through the Province of Nueva Vizcaya, the Cagayan Valley Road is known as the Bayombong–Santa Fe Road, with a total length of 49 kilometers. Sections of this road were surfaced from Km. 229 to Km. 238, Km. 238 to Km. 241, Km. 245 to Km. 249, and Km. 244 to Km. 245, a total of 16.7 kilometers being thus completed as first class. The section from Km. 250 to Km. 251 was converted into a second-class road. Grading was undertaken by force account from Km. 243 to Km. 244 and by the "paquiao" system from Km. 228 to Km. 229. The work accomplished represents 48 per cent of that necessary for completion and the expenditures and liabilities incurred amounted to ₱92,346.60.



Cagayan Valley Road, under construction, Km. 211, Nueva Ecija

Dasol–Infanta Road, Pangasinan

Cagayan Valley Road, Isabela Province.—The section of the Cagayan Valley Road thru the province of Isabela is 74 kilometers long. The work accomplished during the year consisted of subgrade work and raising portions of the subgrade previously constructed which was found to be too low. First course surfacing was placed on 19.4 kilometers and 4 kilometers were converted into first-class road. The sum of ₱121,829 was expended.

Cagayan Valley Road, Cagayan Province.—The work accomplished consisted of completing the subgrade from Alcala to Lal-lo, a distance of 45.66 kilometers, of which 17.47 kilometers were completed as second-class. Ten kilometers of subgrade work was done by contract and the rest by administration. The expenditures and liabilities incurred amounted to ₱109,865.53.

Bataan–Zambales Interprovincial Road.—The Bataan portion of this road is 19.5 kilometers long, from Dinalupihan to the boundary; within the Province of Zambales the length is 20 kilometers, from Subic to the boundary. The sum of ₱42,526.46 was expended on the Bataan side for the construction of 1,860 lineal meters of trail, 27 spillways, 3 temporary bridges, and the widening of 4 kilometers to 6 meters roadway. On the Zambales side, the sum of ₱55,954.43 was spent in grading and surfacing the section between Subic and Olongapo, a distance of 10 kilometers.

Tarlac–Camiling Road, Tarlac Province.—The expenditures and liabilities incurred on this project during the year amounted to ₱53,266.95 which was used in completing 5 kilometers of subgrade and the surfacing of 6.75 kilometers. Contracts were awarded to two local contractors for furnishing a total of 10,450 cubic meters of first-course stone.

Burgos–Dasol–Infanta Road, Pangasinan Province.—This road is part of the Pangasinan–Zambales Interprovincial Road and is 30 kilometers long, from Burgos to the Zambales boundary. The sum of ₱35,233.03 was spent for completing 8.6 kilometers from Burgos to Barrio Eguia and a feeder road to Dasol, 0.6 kilometers; a total of 9.2 kilometers.

Bongabong–Baler Trail.—From Bongabong, Nueva Ecija, to Baler, Tayabas, is a total distance of 105 kilometers; 30 kilometers on the Nueva Ecija side and 75 kilometers in Tayabas. On the Nueva Ecija side, 8 kilometers of subgrade were completed, with an expenditure of ₱21,316.90. Further surveys were made with a view of securing the best location. On the Tayabas side, 13 kilometers of subgrade were completed, with an expenditure of ₱27,531.65.

Tarlac–Camiling Road, under construction, Tarlac

Temporary structures were also constructed, so that the completed sections may be used.

Cabanatuan–Bongabong Road, Nueva Ecija Province.—The distance between Cabanatuan and Bongabong is 29 kilometers. During the year, 7 kilometers of subgrade were completed with the use of road graders and tractors. First course surfacing was placed on 3 kilometers of subgrade, and temporary bridges were constructed. The amount of ₱31,986.55 was expended during the year. Passenger motor trucks were allowed to operate on this road after the temporary bridges had been constructed.

Camarines Sur–Camarines Norte Interprovincial Road.—The proposed road is about 78 kilometers long, from the town of Pamplona, Camarines Sur, to the town of Basud in Camarines Norte. The Camarines Norte section is only 16 kilometers long, the boundary being at the Tuaca River. On this section, the amount of ₱40,927.87 was expended for subgrading from Km. 4 to Km. 9 and for the construction of concrete pipe culverts and temporary timber bridges.

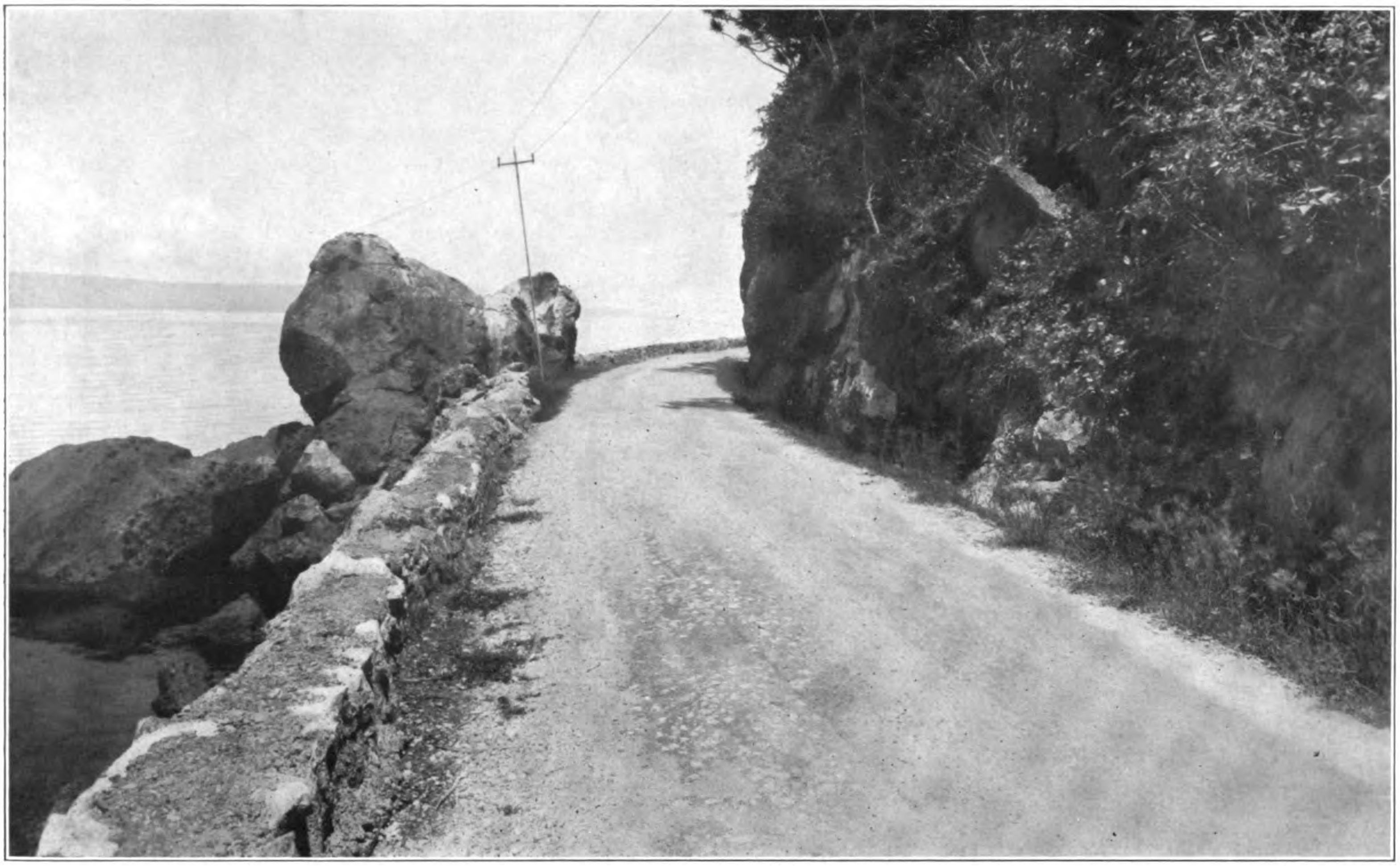
On the Camarines Sur side, the sum of ₱34,822.43 was expended for grading, surfacing and the construction of concrete pipe culverts. Five temporary bridges were also constructed. Contract was awarded for surfacing Km. 1 to Km. 13 with gravel, 2 meters wide and 10 centimeters thick.

Laguna–Batangas Interprovincial Road.—The section of this road within the province of Batangas is known as the Tanauan–Alaminos Road and is 7.36 kilometers long. The sum of ₱11,153.81 was spent in Batangas for completing the grading of 3.54 kilometers and surfacing 6.14 kilometers with first course material 2.5 meters wide.

The section of this road within the province of Laguna is known as the Alaminos–Santo Tomas Road and is only 4.4 kilometers long. The amount of ₱13,946.96 was spent for grading from Km. 94 to Km. 96, and from Km. 98 to Km. 100 (the boundary line) or a total of 3.53 kilometers. Sections of Kms. 94, 95, 96, and 98 were surfaced totalling 2.12 Kms.

Baybay–Abuyog Road, Province of Leyte.—The length of this road is 51 kilometers. It will connect the town of Baybay, on the west coast of the province of Leyte, with Abuyog, on the east coast. On the Baybay side, 7.4 kilometers were completed and declared first-class in previous years. Due to the limited amount of funds provided, it was decided to first construct a trail 3 meters wide for the rest of the distance, in order to open this road to traffic at the earliest possible date. With the opening of this trail during the year, the east and west coasts of the province are now connected, making it possible to travel by horse from Abuyog to Baybay. The amount spent during the year was ₱59,664.45, while the total expenditure to date is ₱214,177.65.

Ormoc–Capoocan–Carigara Road, Province of Leyte.—This is another important road project which will connect the west and the north coasts of the province and open up a vast agricultural plain of practically virgin land. During previous years, 8 kilometers of subgrade were constructed and during 1927 five (5) kilometers of



Dumaguete North Road, Oriental Negros

this section were surfaced; and five (5) concrete culverts and seven (7) timber bridges were constructed. The amount of ₱24,732.61 was used for completing investigations and surveys.

Loay–Interior Road, Province of Bohol.—The total length of this road, from the town of Loay on the southern coast of the island of Bohol, to the barrio of Ipil on the northern coast, is 79.4 kilometers, of which 53.8 kilometers were declared first-class in previous years. The work during the year started from the agricultural Colony [the end of the first class road (Km. 72.4)] and proceeded toward the barrio of Ipil, a distance of 25.6 kilometers. Nine and six-tenths (9.6) kilometers of subgrade were completed to Km. 82, and the grading of 7 kilometers between Kms. 83 and 89 was 50 per cent completed. The expenditures and liabilities were ₱61,937. The subgrade was done by contract and the construction of permanent culverts, of which 14 were completed, was done by administration.

Catbalogan–North Road, Province of Samar.—The completion of this project will connect the town of Calbayog with Catbalogan, the capital of the province, by a road 75 kilometers long. From Calbayog to Tambungan, a distance of 21 kilometers, the road was declared first class in previous years. From Tambungan to Gandara, a distance of 9.6 kilometers, the subgrade has been completed and 2.5 kilometers of surfacing applied.

From Catbalogan, 5.5 Kms. of first class road and 17.6 kilometers of subgrade were completed in previous years. During this year, 10 kilometers of this subgrade were surfaced and 14.4 kilometers of trail, 3 meters wide, were added. The total expenditure, including the cost of pipe culverts and temporary bridges, amounted to ₱72,515.97.

Catbalogan–Wright–Taft Road, Samar Province.—The total appropriation for this project was ₱130,461.45, ₱44,082,81 of which was used for the surfacing of 5.0 kilometers of the subgrade completed in previous years, the widening of 8.2 kilometers of 3-meter trail and the construction of a temporary bridge 66 meters long. All this work was done between Catbalogan and Wright.

From Wright, on the west coast, to Taft, on the east coast, the distance is about 68 kilometers, according to a preliminary survey. The Wright–Loquilocon section, 11.9 kilometers long, was constructed some years ago, but due to excessive grades some sections had to be relocated. Eight and nine-tenths (8.9) kilometers of subgrade were completed. The total amount spent between Wright and Taft, including the survey and the construction of concrete culverts, was ₱39,551.16.

Lanao–Cotabato Interprovincial Road, Province of Lanao.—This proposed road will connect Dansalan, the capital of Lanao Province, and Cotabato, the capital of Cotabato Province. The length of the proposed road has not been determined as the final location was not completed by the end of the year. From Dansalan to Ganasi, the distance is 38 kilometers, and from Ganasi to Malabang, 50 kilometers. A total of ₱54,530.79 was spent on the Lanao side and the work accomplished included widening to 6 meters, 10 kilometers of old trail 3 meters wide; construction of a 6-meter subgrade from Km. 10 to Km. 19; construction of 22 reinforced concrete pipe culverts and 15 temporary wooden bridges; relocation of certain sections beween Dansalan and Ganasi, and investigation and survey from Ganasi to the Lanao–Cotabato boundary, thru the town of

Parang. The road was made passable to motor vehicle traffic from Dansalan to Tugaya, a distance of 19 kilometers.

Lanao–Cotabato Interprovincial Road, Cotabato Province.—On the Cotabato side, the sum of ₱43,506.97 was expended for investigation and survey from Cotabato to the boundary (56.42 kilometers), preparation of the plan and profile, and the construction of 9.5 kilometers of subgrade.

Davao–Cotabato Interprovincial Road, Cotabato Province.—Investigations and surveys were undertaken, but final location could not be completed during the year. The sum of ₱5,700.94 was expended for this work on the Cotabato side. The first preliminary survey followed the lower valley of the Cotabato River, but for various reasons this was abandoned and another line was run following the upper valley. Eventually the road will start from Simuay and pass thru Bual, Ft. Pikit and Kidapawan to the boundary.

Davao–Cotabato Interprovincial Road, Davao Province.—On the Davao side, the road, after leaving Davao, will pass thru Santa Cruz and the barrio of Digos and then turn into the interior to the boundary. As on the Cotabato side, it was necessary to run a number of preliminary lines in order to find the best location. The amount of ₱29,848.30 was spent for the investigations and surveys and for the construction of the subgrade and temporary bridges on the approved alignment between Davao and Digos.

Misamis–Zamboanga Interprovincial Road, Misamis Province.—This road will connect the town of Plaridel in Misamis with Dapitan, Zamboanga. The Misamis section is 25.2 kilometers long, which is the distance from Plaridel to the boundary. The survey was completed and repair of the old subgrade near Plaridel was undertaken. The total amount spent was ₱5,366.67.

The length of this road within the province of Zamboanga is 34 kilometers. The amount of ₱28,500 was spent for surveys and investigations and the subgrading of 4.48 kilometers. The completed section was surfaced and reinforced concrete culverts and temporary bridges were constructed.

Misamis–Lanao Interprovincial Road, Province of Misamis.—This road extends from the town of Initao, Misamis, to the town of Iligan, Lanao, a distance of 35.3 kilometers. From Initao to the boundary the distance is 21.6 kilometers. The survey was completed and the plan approved during the year. The expenditures amounted to ₱4,151.39.

On the Lanao side, the road had been constructed in previous years, 4 kilometers having been declared first class, and 9.7 kilometers, second class.

Surigao–Agusan Interprovincial Road, Province of Agusan.—The sum of ₱24,679.37 was spent for investigation and survey and the construction of a portion of the Cabadbaran–Santiago Section of this road, which is 17.5 kilometers long. The survey to the boundary from Santiago has not been completed.

On the Surigao side, the road starts at the barrio of Tubud and will pass over the plains on the east coast of Lake Mainit. Only a preliminary survey has been completed.

Iloilo–Capiz Interprovincial Road, Province of Capiz.—This road will connect the town of Dumalag, in Capiz, with Calinog, in Iloilo, a distance of 30.44 kilometers. The Capiz section, which is from Dumalog to the boundary, is 19.6 kilometers long. Of this, 6.5 kilometers of 3-meter trial have been constructed. The survey was also completed during the year. The expenditure amounted to ₱14,353.70.

On the Iloilo side, the survey was completed, but no funds were provided for construction work.

Table VI gives a complete list of active road construction projects by provinces and shows the status of each project.

Table VII is a comparison of the lengths of the different classes of roads in existence as of December 31, 1926, and December 31, 1927.

TABLE VI.—*Active road construction projects during 1927*

Province	Name of project	Total length	Completed in 1927	Expenditures in 1927	Total appropriation to December 31, 1927	Remarks
		Kms.	*Kms.*			
Abra	Peñarrubia–Villaviciosa–Pilar (Peñarrubia–Pau Section)	25.0	4.0	₱8,553.26	₱55,332.25	Subgrade.
	Bangued–La Paz–Lagayan	20.0	....	3,702.05	35,450.18	Improvement of subgrade.
Agusan	Butuan–Cabadbaran	29.0	....	33,397.16	295,036.51	Grading, surfacing, temporary bridges.
	Cabadbaran–Santiago	17.5	....	24,679.37	30,594.78	Grading 6 kilometers, cleared 10 kilometers.
	Butuan–Nasipit	40.0	4.0	10,276.98	40,505.98	Survey and 4 kilometers of subgrade.
Albay	Naga–Joroan	6.3	5.0	8,308.30	50,638.04	Graded 5 kilometers, surfaced 4 kilometers.
	Polangui–Nasisi–Ligao	13.0	....	18,590.37	52,883.60	Completed first-class.
	Malinao–Estancia	8.33	3.0	715.75	20,148.74	Grading and surfacing; culverts constructed.
	Legaspi–Manito	30.0	4.0	19,059.19	23,018.87	Grading; survey and investigation; culverts constructed.
Albay	Daraga–Gapo	3.5	1.5	2,245.47	10,123.56	Grading.
	Pandan–Caramoran	9.4	0.6	2,797.37	18,526.89	Do.
	Viga–Pañganiban	4.83	0.18	3,010.15	13,089.00	Do.
Antique	San Jose–Dao–Anini-y	40.2	....	10,579.29	44,340.26	Surfacing and culvert construction.
	Patnoñgon–North	97.2	....	24,301.86	281,995.97	Improving subgrade and construction of reinforced concrete culverts.
	Bugason–Valderrama	11.2	4.9	7,361.89	16,382.78	Subgrade, concrete pipe culverts.
	Antique–Iloilo Interprovincial Road	11.1	....	16,056.82	286,006.85	Improving subgrade, surfacing, construction of reinforced concrete culverts.
Bataan	Dinalupihan–Zambales Boundary (Zambales–Bataan interprovincial)	19.5	4.1	42,526.46	107,605.55	4.1 kilometers subgrade, 6.3 kilometers trail.
	Orion–Limay	8.1	2.66	38,053.01	40,567.96	Surfacing complete.
Batangas	Tanauan–Talisay	16.32	4.82	18,281.93	166,354.15	4.5 kilometers complete, 0.32 kilometer first course metalling.
	Lipa–Balete	11.85	1.00	2,747.07	63,536.87	Grading.
	Balayan–Calatagan	22.0	....	6,789.80	105,557.64	2 R. C. culverts, 1 wooden bridge on R. C. piles.
	Rosario–Bolboc	22.1	2.7	12,264.16	272,705.81	Declared first-class.
	Batangas–Taysan	20.0	2.0	4,604.72	19,048.02	Grading only.
	Bauan–Mabini	10.4	....	3,320.07	30,206.57	Relocation survey.
	Taal–San Luis	2.72	1.2	9,488.24	9,629.49	1.2 graded, 820 meters surfaced, 1 temporary bridge built.
	Tanauan–Alaminos	7.36	6.14	11,153.81	19,046.29	Interprovincial: Batangas–Laguna.
	Cuenca–Banaybanay–Lipa	14.7	4.5	19,724.35	20,378.07	Shorten distance to Manila from Cuenca by 25 kilometers.
	Bolboc–Tayabas Boundary	2.4	1.6	18,736.75	25,013.93	Reconstruction by raising subgrade. Batangas–Tayabas Interprovincial Road.
	Batangas–Cavite Interprovincial Road	18.4	3.0	35,306.98	35,498.70	Grading only. Connects Tuy, Batangas, and Mendez-Nuñez, Cavite.
	Batangas–Laguna Interprovincial Road	8.64	4.74	20,397.60	21,118.08	Surfacing, connects Santo Tomas, Batangas, and Alaminos, Laguna.
	Rosario–Taysan	7.36	0.72	8,120.33	8,120.33	720 meters graded, 320 meters, of which surfaced.
	Tuy–Calatagan via Lian	17.8	1.8	15,015.31	20,719.14	Grading and culverts.
Bohol	Carmen–Sierra Bullones	9.5	1.1	1,493.90	16,644.81	Surfacing only.
	Loay–Interior (Colonial–Ipil Section)	25.6	9.0	61,937.04	411,815.18	Grading by contract; structure by administration.
	Corella–Sikatuna	6.6	0.8	2,857.15	17,825.61	Surfacing only.
	Batuanan–Ubay	20.8	0.9	16,158.48	20,000.00	Expenditure includes cost of survey and plan.
	Inabanga–Jetafe	20.8	0.78	15,737.64	25,000.00	Do.

TABLE VI.—*Active road construction projects during 1927*—Continued

Province	Name of project	Total length	Completed in 1927	Expenditures in 1927	Total appropriation to December 31, 1927	Remarks
		Kms.	*Kms.*			
Bukidnon	Valencia–Maramag	21.0	6.00	₱7,107.86	₱7,161.80	Third-class, graded.
Bulacan	Meycauayan Diversion	1.74	....	16,774.28	107,000.00	Expenditures were for the acquisition of the right-of-way and in clearing.
	San Miguel Diversion	1.74	1.06	3,181.87	78,000.00	Grading and acquisition of right-of-way.
	Bocaue Diversion	.96	.22	8,600.57	18,000.00	Grading.
Cagayan	Cagayan Valley	44.66	17.47	109,865.63	691,174.94	Second-class type "B."
	Cagayan–Mountain Province	40.0	1.46	11,062.34	15,608.94	1.46 kilometers graded, 7 kilometers improved.
	Tuguegarao–Peñablanca	7.9	2.0	3,163.50	3,174.14	Grading only.
	Bangui–Aparri	85.0	17.5	42,220.12	77,384.35	17.5 kilometers of trail constructed, 7 kilometers subgrade improved.
Camarines Norte	Camarines Norte–Camarines Sur Interprovincial Road	16.0	9.0	56,729.54	58,034.66	Subgrade.
	Labo–Paracale	26.5	9.0	23,538.22	142,538.22	Graded 4.5 kilometers, surfaced 4.5 kilometers.
	Camarines Norte–Tayabas Interprovincial Road	78.0	1.0	35,971.38	41,779.60	Trail construction grading 1 kilometer.
Camarines Sur	Naga–Danao	17.4	2.0	17,062.07	283,599.44	Completed 2 kilometers as second-class.
	Pauili–Bula	7.2	2.9	4,740.30	39,525.28	2 R. C. pipe culverts and 1 semipermanent bridge.
	Calabanga–Sabang–Embarcadero	2.3	2.3	3,619.16	12,509.67	Completed as second-class.
	Milaor–Minalabac	3.1	3.1	3,432.68	11,839.11	Do.
	Camarines Sur–Camarines Norte Interprovincial Road	62.0	16.0	34,822.43	55,637.91	Grading and temporary bridge constructed.
Capiz	Capiz–Antique Interprovincial Road	60.9	6.4	42,353.89	70,902.82	1.6 kilometers, 6 meters wide; 10 kilometers, 2 meters trail; 9 R. C. culverts.
	Capiz–Iloilo Interprovincial	30.44	6.5	14,353.70	25,745.50	6.5 kilometers of 3 meters trail.
	Banga–Libacao	18.6	10.47	20,673.57	21,136.08	3 meters trail.
Cavite	Naic–Maragondon	6.1	5.6	18,542.04	39,156.62	Surfacing complete.
	Noveleta–Amaya	10.64	3.3	15,937.99	114,289.99	Grading and surfacing.
	Pasongkauayan–Buenavista	11.4	6.2	15,130.96	18,348.63	Grading.
	Cavite–Batangas Interprovincial Road	22.2	4.0	41,149.43	42,260.03	Do.
Cebu	Cebu–North	128.0	3.3	10,582.51	823,442.10	Surfacing and culvert construction.
	Cebu–South	133.0	....	10,674.64	275,121.74	Surfacing and construction of R. C. culverts.
	Logo–Taboilan	21.0	2.0	40,272.94	155,015.06	Subgrade kilometer 78–82.
	Sagay–Borbon	8.4	0.2	6,656.19	70,151.32	Surfacing complete.
	Ilihan–Tabogon	11.6	2.72	11,597.17	78,665.02	Do.
	Bogo–Nailong	3.8	3.8	18,755.09	18,755.09	Grading and surfacing first and second course.
Cotabato	Cotabato–Davao Interprovincial Road	75.0	....	5,700.94	6,000.00	Investigation and survey.
	Lumopog–Bual	13.87	8.1	29,483.64	65,704.09	Graded 5 kilometers. Surfaced 3.1 kilometers.
	Cotabato–Lanao Interprovincial Road	56.42	9.5	43,506.97	46,173.55	Grading, investigation and survey.
	Pikit–Kabakan	18.6	0.6	4,355.29	13,942.26	Trail construction.
Davao	Davao–South	161.0	....	11,218.62	205,860.97	Grading and improvement.
	Cuabo–Mati–Boston	219.0	1.9	25,857.59	197,567.90	Survey of 31.2 kilometers, 1.9 kilometers graded.
	Davao–North	150.0	1.1	26,513.43	94,032.44	Grading, surfacing and culvert construction.
	Davao–Cotabato Interprovincial Road	....	....	29,848.30	32,786.74	Investigation and survey; grading.
Ilocos Norte	Bangui–Claveria Trail	65.0	12.0	53,598.09	395,577.09	Improving and reconstruction of trails.
	Piddig–Solsona	11.0	....	27,172.40	36,797.52	Surfacing.
	Pinili–Banna–Nueva Era	30.0	8.0	8,173.75	31,776.40	8 kilometers declared second-class. Trail construction.
	Dackel-a-Danum	2.0	1.2	12,556.05	14,283.51	Second-class.
Ilocos Sur	Solsona–Cabugao	50.0	....	6,232.81	10,330.59	Survey and investigation.
	Abra River Diversion	2.2	2.2	22,939.98	88,341.24	Road completed and ferry run by power installed.
	Candon–Galimuyod–Bauguen	12.4	5.0	13,057.50	41,695.07	Grade completed, pipe culverts installed.
Iloilo	Estancia–Balayan	7.6	7.6	28,732.80	28,862.18	Surfacing only.
	Iloilo–Antique Interprovincial Road	11.75	....	82,188.48	338,524.02	Surfacing and repair.
	Janiuay–Lumbanao	15.0	7.8	7,723.35	104,846.13	Repair subgrade and 1st course surfacing.
	Barotac Nuevo–North	56.0	8.4	30,791.90	133,683.63	Grading.
	Sara–San Dionisio	9.3	3.5	10,374.80	74,817.12	Second course surfacing.
	Ajuy–Culasi	13.2	3.0	5,962.23	9,920.04	Repair of old subgrade and 1st course surfacing.
	Santa Barbara–San Miguel	8.0	3.6	17,483.59	20,844.28	Subgrading and 1st course surfacing.
	San Dionisio–Balasan	25.5	16.5	42,242.62	42,325.32	Subgrade work and light surfacing.
Isabela	Cagayan Valley (Cauayan–Ilagan Section)	34.0	....	98,575.03	423,646.54	Improvement of grade and surfacing.
	Cagayan Valley (Ilagan–Cabagan Section)	40.0	....	23,253.97	73,195.05	Improvement of grade and surfacing, and construction of culvert.
	Cauayan–Cabatuan	11.5	4.0	16,123.49	18,348.63	Subgrade and culvert construction.
	Angadanan Viejo–Angadanan Nuevo	5.9	....	10,506.98	44,450.39	Surfacing completed.
Laguna	Santa Rosa–Santo Domingo	9.6	0.5	2,792.66	5,504.58	0.5 kilometer completed first-class.
	Pagsanjan–Luisiana	19.0	5.38	44,568.51	253,281.90	5.38 kilometers completed.
	Pila–Calauan	12.3	1.2	9,396.40	91,658.79	Surfacing.
	San Pablo–Alaminos	8.2	....	109.67	25,958.05	
	Alaminos–Santo Tomas	4.4	2.73	13,946.96	20,767.70	Laguna–Batangas Interprovincial Road Grading.
	Mabitac–Pililla	9.43	9.43	12,080.74	40,664.98	Laguna–Rizal Interprovincial Road Grading.
	Mabitac–Santa Maria	7.0	.84	7,316.78	7,402.80	0.84 kilometer completed as second-class.
Lanao	Iligan–Misamis Boundary	9.7	6.7	7,998.66	8,000.00	Reconstruction of subgrade, construction of 16 R. C. culverts.
	Lanao–Cotabato Interprovincial Road	50.3	9.3	39,544.56	40,000.00	Grading and investigation and survey.
	Dansalan–Ganasi	38.1	10.0	14,986.23	15,000.00	Improvement of 3 meters subgrade. This is a part of Lanao–Cotabato Interprovincial Road. 4.9 kilometers graded standard section.
La Union	Tubao–Pugo	7.6	1.0	4,846.44	7,251.86	Subgrade, relocation survey.
	Balaoan–Santol	5.3	5.3	8,682.56	18,649.11	Grading and surfacing.
	Bacnotan–San Gabriel	8.2	0.2	8,139.40	8,446.48	Grading. Culvert construction.
	Bacnotan–Balaoan	15.72	10.0	52,955.69	72,614.71	Grading and 2 kilometers of trail. Construction of pipe culverts.
Leyte	Baybay–Abuyog	51.0	16.0	59,664.45	214,246.45	3 meters trail.
	Maasin–Matalom	25.0	5.5	17,938.65	177,754.00	Grading.
	Dulag–Abuyog	24.3	3.4	15,385.60	77,189.27	Do.
	Ormoc–Capoocan–Carigara	27.0	1.8	24,732.61	89,934.35	Surfaced 1.8 kilometers. Survey completed.
	Baybay–Inopacan	24.0	3.4	10,570.86	10,581.88	Surfacing.
Marinduque	Boac Diversion (Boac–Mogpog)	1.11	1.11	12,116.15	14,370.00	Grading.
	Santa Cruz–Torrijos	28.0	2.0	25,968.65	117,345.42	Grading and surfacing.
Rizal	Welfareville Road	1.8	1.8	16,513.47	16,513.80	Completed first-class with bridges and culverts.
	Rizal Avenue Extension	2.291	1.97	52,496.00	104,248.58	Grading and surfacing.
	Pililla–Quisao	6.7	3.7	16,770.67	37,089.88	Grading and culvert construction.
	Laguna–Rizal Interprovincial	12.0	5.0	42,442.18	42,442.18	3 kilometers completed first-class, 2 kilometers graded.
Romblon.. Sibuyan Island	San Fernando–Cajidiocan	17.0	4.0	7,201.62	18,296.99	Grading.
Tablas Island	Odiongan–Looc	25.0	....	9,828.98	21,947.56	Surfacing 12.6 kilometers and trail construction.
.....do	Carmen–Daspujol–Odiongan	48.0	....	25,788.29	200,567.43	Grading, surfacing, trail construction.
Samar	Catbalogan–North	88.2	4.9	54,512.81	654,359.42	6.2 kilometers of 3 meters trail and surfacing of completed subgrade.
	Catbalogan–South	29.0	5.0	8,101.90	15,407.71	Surfacing.
	Catbalogan–Taft Intercoastal	98.0	8.9	128,118.48	128,034.87	Grading, surfacing and surveying.
	Sulat–Oras	45.5	....	20,727.06	58,426.98	Grading and surfacing.
	Guiuan–Salcedo	17.0	....	10,076.32	16,343.00	Improvement and relocation.
	Tambungan–Gandara	9.5	2.0	18,003.16	24,349.33	Surfacing.
	Allen–Mauo	9.0	3.4	7,492.79	7,500.00	Grading.
	Borongan–South (Cobang Diversion)	2.38	1.56	4,821.69	5,000.00	Do.

TABLE VI.—*Active road construction projects during 1927*—Continued

Province	Name of project	Total length	Completed in 1927	Expenditures in 1927	Total appropriation to December 31, 1927	Remarks
		Kms.	*Kms.*			
Sorsogon	Donsol–Pilar	12.0	12.0	₱6,172.16	₱33,774.00	Improvement of second-class road.
	Sorsogon–Albay Interprovincial	41.1	6.0	31,037.20	469,523.47	Surfacing.
	Juban–Irosin	19.7	10.0	47,672.70	103,044.50	Do.
	Bulusan–Irosin	16.0	11.0	17,775.41	135,090.17	Do.
	Pili–Castilla	4.65	3.2	6,988.90	19,549.87	Surfacing first course.
	Gubat–Casiguran	21.6	8.0	13,923.57	14,000.00	Surfacing.
	Gate Matnog	17.2	....	7,226.92	8,000.00	Grading.
Nueva Vizcaya	Bayombong–Santa Fe	49.0	16.7	92,346.60	193,499.63	16.7 kilometers surfaced first-class; 1 kilometer second-class; 2.26 kilometers graded.
Occidental Negros	Escalante–Calatrava	....	....	81,969.87	156,347.54	
	La Castellana–Isabela	13.0	....	28,163.70	39,628.14	Subgrade completed, 3 kilometers surfaced.
	Ma-ao–La Carlota	5.8	....	5,020.84	88,958.68	Completed and declared first-class.
	Cabankalan–Cauayan	20.5	....	17,450.22	94,519.53	Surfacing.
	Binalbagan–Isabela	13.0	....	27,855.67	37,415.63	Do.
	Pontevedra–Antipolo	....	....	7,234.90	11,700.50	Grading.
	Murcia–Cansilayan	6.0	....	13,105.97	17,141.09	Surfacing.
	Sagay–Vito	6.0	....	10,315.49	11,112.12	Grading.
Oriental Negros	Dumaguete–North	117.0	21.4	39,832.00	448,960.11	2.4 kilometers completed first-class, 19 kilometers subgraded.
	Guihulngan–Vallehermoso	34.0	10.0	39,888.78	74,025.27	
	Tanhay–Pamplona	7.0	2.75	10,905.88	19,368.83	1.25 kilometers first-class, 1.5 kilometers subgrade.
	Lazi–Maria (Siquijor)	11.1	9.0	9,993.51	10,000.00	Subgrading and light surfacing.
Palawan	Lucbuan–San Carlos	7.56	6.91	10,551.70	11,000.00	Subgrade. On the Island of Cuyo.
	Puerto Princesa–Irahuan	14.00	3.56	20,055.40	35,376.38	Survey, 3.56 kilometers subgrade, 1.80 kilometers surfaced, temporary structures.
Pampanga	Arayat–Magalang	9.0	5.03	8,439.01	11,146.08	2.65 kilometers subgraded, 1.33 first course surfaced, 1.05 kilometers completed.
	Angeles–Magalang	12.2	5.66	32,051.43	100,748.60	5.66 kilometers subgraded; first-class surfacing 4.06 kilometers; 1.58 kilometers completed.
	Santa Rita–Porac	11.52	....	2,705.44	18,215.65	Survey and plan completed.
Pangasinan	Binalonan–San Manuel	8.01	1.00	2,062.43	5,105.48	Subgrade completed.
	Malasiqui–Villasis	19.76	4.9	18,571.82	25,000.00	Surfacing.
	Inmanduyan Diversion	....	....	6,784.95	10,000.00	Grading complete.
	Burgos–Dosol–Infanta	30.0	9.2	35,233.03	82,530.24	Surfacing complete.
	Mangatarem–Tarlac Boundary	11.5	3.0	6,106.84	58,960.74	Surfacing and culvert construction.
Masbate	Masbate–Dimasalang	....	4.6	17,891.67	22,365.99	Graded 4.6 kilometers, surfaced 700 meters culvert, temporary bridges.
	San Jacinto–San Fernando	15.0	3.7	20,453.16	43,425.28	Grading and surfacing.
	Masbate–Lumbang	10.6	8.5	18,680.37	107,687.11	Declared first-class.
Mindoro	Calapan–Pinamalayan	69.0	10.2	39,111.57	403,182.02	Surfacing.
	Pola–Jolo	12.0	5.0	27,881.41	48,199.58	Grading.
Misamis	Initao–Lanao Bdry. Interprovincial Road	25.5	....	4,151.39	30,000.00	Investigation, survey; plan completed.
	Calamba–Baliangao	13.0	....	3,500.00	3,449.52	Survey and reconstruction.
	Misamis–Zamboanga Interprovincial Road	19.5	....	5,366.67	30,000.00	Investigation, survey; plan completed.
	Tagoloan–Salay	38.0	11.00	....	30,936.98	Grading.
Mountain Province	Kabugao–Solsona Trail	42.0	17.00	9,395.28	9,395.28	Trail construction.
Nueva Ecija	San Jose–Santa Fe	58.0	6.0	75,164.74	1,391,288.54	Widening of narrow sections.
	Boñgabong–Baler Trail	31.2	8.0	21,316.90	34,648.95	Trail only, Nueva Ecija side.
	Boñgabong–Baler Trail	75.0	13.0	27,531.65	44,975.24	Trail only, Tayabas side.
	Talavera–Licab	18.6	1.6	16,781.44	142,913.60	Grading and surfacing.
	Cabanatuan–Boñgabong	29.0	7.0	31,986.55	138,800.76	Subgrade, 3 kilometers surfaced.
	Santa Rosa–Zaragoza	15.6	....	5,481.80	71,253.67	Light surfacing.
	San Jose–Lupao–Umingan	16.0	2.0	19,064.01	43,968.19	Subgrade and surfacing.
	Cuyapo–Nampicuan	6.52	2.0	10,635.51	22,479.06	Do.
	Tambo–San Leonardo	7.0	3.0	2,206.37	5,876.08	Subgrade.
	Casili–Rizal	23.0	7.0	21,079.82	63,035.00	Do.
	Bukot–Zaragoza	9.5	6.0	31,827.63	47,678.46	Surfacing.
	Digdig–Caranglan	16.0	3.0	8,485.22	12,999.10	Subgrade.
	Laur Branch	9.0	1.5	3,258.39	5,168.29	Do.
Sulu	Guimba–Pura	8.19	3.0	29,215.20	29,575.17	Surfacing.
	Jolo–Bud Daho–Romandier	16.0	1.5	8,429.34	32,041.96	Clearing and grading.
	Jolo–Taglibi	13.5	1.0	12,421.07	34,633.17	Grading, temporary bridges and pipe culverts.
	Indanan–Silangkan–Parang	17.95	....	4,359.08	17,947.35	Grading.
	Tandu Batu–Karundung	18.0	....	161.64	6,554.44	Clearing.
	Campagayo–Kulaykulay	9.0	....	525.68	6,331.73	Do.
	Indanan–Parang	10.6	....	4,619.56	11,692.43	Surfacing.
	Junction 2–Lake Siet	29.45	....	8,325.25	17,985.29	Improving grade.
	Kulaykulay–Camp Andres Camp Romandier–Siet Lake	25.5	....	16,402.22	21,492.87	Improving grade pipe culverts.
	Parang–Maimbung	1	....	836.54	836.54	Clearing.
Surigao	Placer–Gigaquit	19.34	....	43,212.06	107,320.49	Graded and surfaced.
	Carrascal–Cantilan–Lanuza	30.36	....	29,610.18	70,465.23	Grading.
Tarlac	Tarlac–Camiling	21.75	6.5	53,266.95	88,150.71	Surfacing.
	Murcia–Mabalacat	18.1	0.5	4,983.19	85,875.94	Tarlac–Pampanga Interprovincial Road, surfacing only.
	San Manuel–Carmen	9.79	9.79	37,698.80	40,000.00	Tarlac–Pangasinan Interprovincial Road. Subgrade completed.
	San Julian–Anao	5.7	0.8	10,000.00	26,979.80	Surfacing.
	Malacampa–Mayantoc	4.2	0.5	2,490.89	10,295.58	Grading and surfacing.
Tayabas	Lucban–Sampaloc–Mauban	30.0	5.3	66,015.46	436,354.15	Grading.
	Infanta–Puerto Real	11.0	5.9	14,499.64	30,959.67	Do.
	Gumaca–Pitogo	26.0	8.09	47,029.47	103,179.54	Do.
	Lucena–Dalahican	4.21	2.95	8,264.24	8,454.91	Do.
	Tayabas–Camarines Norte Interprovincial	25.0	3.56	44,835.99	47,442.92	0.72 kilometer surfaced; 3.5 kilometers graded; 9.72 kilometers trails, 1.52 meters wide.
Zambales	Iba–South (San Francisco–Cabanga Section)	16.0	3.0	15,483.10	67,702.23	Grading and surfacing.
	Botolan–Binaclutan	9.0	....	2,121.32	30,629.01	Structures; surfaced 1.0 kilometer.
	Matalvis–Palauig	16.2	9.2	26,316.86	51,169.00	Grading and 2 kilometers surfacing.
	Zambales–Bataan Interprovincial	20.00	10.00	55,954.43	122,912.00	Survey, grading, surfacing.
	Zambales–Pangasinan Interprovincial	23.4	10.4	39,715.06	40.000.00	Surfacing.
Zamboanga	Dapitan–Dipolog	38.0	....	54,780.00	54,780.00	Improvement.
	Isabela–Lamitan	27.0	4.8	18,800.00	20,000.00	Grading and surfacing.
	San Ramon–Patalon	6.5	....	20,450.60	20,460.16	Surfacing.
	Bolong–Carmen	14.0	4.0	30,000.00	32,478.00	Grading, 1.6 kilometers surfaced.
	Zamboanga–Misamis Interprovincial	24.0	4.48	28,500.00	30,000.00	Grading and light surfacing.

TABLE VII.—*Comparison of lengths of different classes of roads in existence in various provinces as of December 31, 1926 and December 31, 1927*

Province	First-class roads		Second-class roads		Third-class roads		Trails	
	December 31, 1926	December 31, 1927	December 31, 1926	December 31, 1927	December 31, 1926	December 31, 1927	December 31, 1926	December 31, 1927
Abra	64.4	64.4	17.0	23.0	11.4	15.0	112.6	102.7
Agusan	.....	.....	25.7	28.1	24.5	22.7	45.5	45.0
Albay	208.2	217.8	24.9	23.9	27.9	41.4	112.2	103.2
Antique	108.8	108.8	116.0	116.0	3.5	6.0	13.7	12.2
Baguio, City of	47.8	67.0	15.6	3.1	0.3	2.0	.....	.....
Bataan	36.6	41.3	19.1	21.2	2.3	2.4	75.7	109.0
Batangas	204.8	208.5	34.6	44.4	140.0	134.9	44.8	83.7
Benguet	72.4	72.4	75.9	136.6	8.2	4.6	2.8	20.6
Bohol	244.0	249.6	100.4	97.0	28.2	41.4	4.0	49.1
Bukidnon	.....	.....	103.1	103.1	43.3	44.3	70.2	70.0
Bulacan	116.5	116.3	138.6	138.6	63.9	63.8	.....	.....
Cagayan	72.8	74.0	85.1	101.1	65.9	55.1	106.3	101.3
Camarines Norte	34.3	34.3	6.0	14.1	12.1	13.1	32.6	63.2
Camarines Sur	161.2	162.0	24.8	35.1	50.8	58.8	39.1	33.1
Capiz	201.2	204.1	94.9	92.0	14.4	14.4	119.5	130.2
Cavite	85.5	99.5	29.3	31.9	9.5	8.2	107.8	126.6
Cebu	334.7	337.3	279.7	294.3	102.2	92.3	26.8	25.0
Cotabato	22.3	25.3	1.9	4.7	45.8	47.1	336.8	329.7
Davao	29.8	30.8	10.8	10.3	46.5	51.1	576.4	572.3
Ilocos Norte	84.9	91.4	111.9	106.3	12.4	13.6	56.2	56.2
Ilocos Sur	181.8	184.2	17.1	23.8	.....	.....	.....	3.5
Iloilo	287.1	287.1	65.2	97.0	126.0	118.0	8.9	18.4
Isabela	82.1	86.1	41.9	61.3	100.7	72.0	.....	.....
Laguna	161.4	161.4	31.3	42.4	45.9	46.9	8.5	8.5
Lanao	43.4	43.4	21.8	19.7	36.3	38.5	275.2	295.0
La Union	117.2	121.1	37.4	49.0	22.8	7.4	9.5	9.5
Leyte	140.0	141.8	79.4	98.7	82.9	70.9	79.8	83.1
Marinduque	51.5	51.5	25.8	32.4	0.5	0.5	56.6	50.6
Masbate	86.0	44.6	15.8	11.6	8.2	8.6	.....	4.1
Mindoro	40.2	55.0	33.3	34.1	21.5	23.8	273.7	268.2
Misamis	122.0	122.0	111.7	125.7	60.5	46.7	129.4	129.2
Mountain Province	.....	.....	130.9	169.5	190.7	151.1	1,086.0	1,086.0
Nueva Ecija	199.2	208.2	46.1	53.7	217.3	236.9	.....	.....
Nueva Vizcaya	49.8	66.5	23.4	29.1	58.8	36.9	145.3	135.3
Occidental Negros	360.9	363.9	65.1	63.8	85.9	84.8	55.8	54.7
Oriental Negros	173.6	179.3	30.5	57.6	77.0	61.9	157.5	139.8
Palawan	.....	.....	2.9	7.0	52.0	58.8	82.4	89.9
Pampanga	201.1	203.4	63.2	65.9	93.7	95.8	.....	.....
Pangasinan	489.8	499.2	51.6	55.6	156.0	143.2	.....	.....
Rizal	185.5	191.6	20.9	22.2	27.7	39.9	15.0	12.7
Romblon	.....	.....	46.5	55.4	4.8	0.8	232.9	226.6
Samar	108.3	110.6	112.9	123.7	94.8	86.0	28.0	20.9
Sorsogon	118.7	130.7	66.0	64.2	10.2	.....	.....	.....
Sulu	26.8	26.8	23.7	23.7	9.1	9.1	137.9	94.9
Surigao	54.3	54.3	.....	3.3	22.0	25.2	34.8	.....
Tarlac	160.8	161.8	8.5	17.8	39.0	39.7	5.0	.....
Tayabas	193.2	099.6	26.9	57.5	65.2	57.2	.....	.....
Zambales	68.2	82.9	44.2	44.6	28.6	24.0	11.4	8.4
Zamboanga	62.1	62.1	52.2	91.6	29.4	6.3	115.5	108.5
Total	5,846.7	6,033.9	2,611.1	3,031.9	2,480.6	2,322.8	4,831.9	4,879.9

BRIDGES

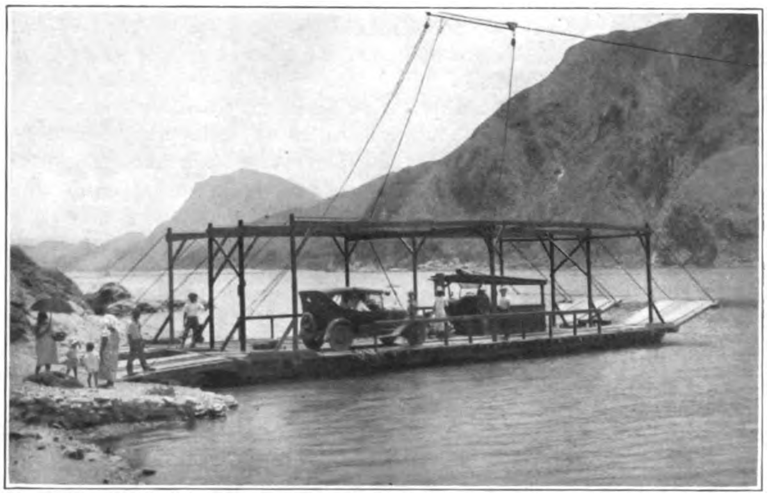
The following are some of the more important bridges completed or under construction during 1927:

Sinalang Bridge, Abra Province.—This bridge over the Sinalang River on the Interprovincial Road connecting the Provinces of Abra and Ilocos Sur consists of one 160-foot and two 53-foot steel spans with concrete floor. The substructure, consisting of two concrete abutments and two piers, was completed by contract. Funds were made available during the latter part of the year for completing the superstructure. This work was advertised and should be completed during the next dry season.

Oas Bridge, Albay Province.—This structure is a suspension bridge over the Bicol River, for pedestrians only. It connects the town of Oas with many important barrios. The construction of this bridge was let under contract to Mr. Andres Bolinas, Jr.

Lagnas–Hagonoy Bridges, Batangas Province.—The construction of these bridges over the Lagnas and Hagonoy rivers on the Batangas–Bauan Road was necessary to replace the Spanish adobe arch bridges destroyed by the typhoon of November 5, 1926. The new structures are a 22-meter concrete arch, with spandrel walls and approach spans, having a total length of 39.20 meters, for the Lagnas Bridge, and a 15-meter concrete arch, with spandrel walls and approach spans, of a total length of 33 meters, for the Hagonoy Bridge.

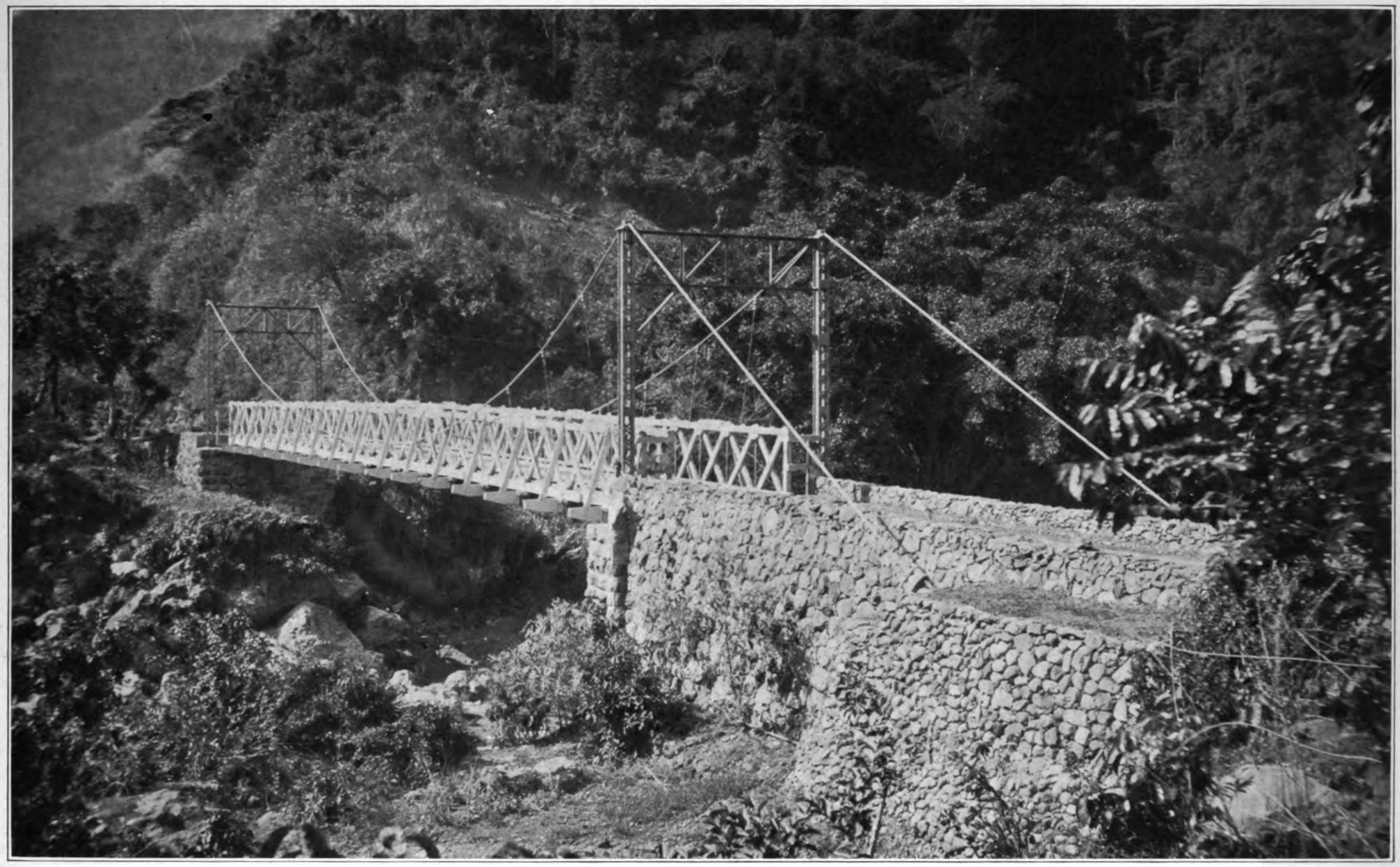
Both bridges were constructed under contract by Mr. Juan Ferrer of Manila at a price of ₱27,500 for the Lagnas Bridge and ₱21,100 for the Hagonoy Bridge. The Lagnas Bridge was opened to traffic on December 6, 1927, the Hagonoy Bridge was 99 per cent completed on December 31, 1927, leaving only the balustrades to complete the concrete work.



Abra River power ferry, Km. 438.2, Manila–North Road, Ilocos Sur

Malopale Bridge, Bukidnon Province.—This is a suspension bridge with steel towers and beams, concrete anchors and abutments, and has a span of 120 feet. It is located on the Malaybalay–South Road. The work was commenced during the middle of the year and the abutments, back-stays and towers were completed during the month of June. The bridge was completed during the month of August and opened to traffic on September 10, 1927.

Noveleta Bridge, Cavite Province.—This is an 80-foot steel bridge. The work was let by contract and on December 31, 1927, the abut-



Butac Bridge, Km. 388.46, Tagudin-Cervantes Road, Ilocos Sur

ments were practically completed. With the present rate of progress, it is expected that this bridge will be completed during the month of January, 1928.

Mananga Bridge, Cebu Province.—This structure is a suspension bridge with steel towers, and a wooden superstructure, having a clear span of 200 feet, resting on concrete abutments. The work was completed on September 1, 1927, and opened to traffic immediately.

Talisay Bridge, Camarines Norte Province.—This bridge is an 80-foot riveted Pony steel truss, having a clear roadway of 16 feet, with concrete floor and abutments. It is located on the Daet–Talisay Road. Work was begun during the latter part of 1926 and completed in March, 1927. The steel for the superstructure was furnished by the Atlantic, Gulf and Pacific Company of Manila and the erection was done by administration.

Butac Bridge, Ilocos Sur Province.—The construction of this bridge on kilometer No. 388.46 of the Tagudin–Cervantes Road was completed on April 30, 1927. The structure is a 160-foot suspension bridge with steel towers resting on rubble masonry abutments. The work was done by administration.

Borobor Bridge, La Union Province.—This bridge is located on Kilometer No. 346.24 of the Manila North Road, and consists of four 9-meter reinforced concrete slab and girder spans on concrete piles. The work was done by contract, and completed on December 22, 1927.

Malaunod Bridge, Laguna Province—This bridge is an 11-meter concrete slab and girder, with concrete abutments resting on concrete piles. The contract for construction was awarded to Mr. Fortunato Concepcion of Pasig, Rizal. Work was started during the third quarter of the year.

Hinigaran Bridge, Occidental Negros Province.—This bridge consists of fifteen 9-meter reinforced concrete slab and girder spans on concrete piles, over the Hinigaran River. The work is contracted to Mr. A. G. Yankey. Due to subsoil conditions encountered, it has been found necessary to splice the piles from 3 to 7 meters in length which has caused some delay in the completion of the project.

Bago Bridge, Occidental Negros Province.—This bridge was completed and opened to traffic on March 4, 1927. It consists of five 130-foot steel spans on concrete piers and abutments, with timber and concrete pile foundations. The construction of the substructure was done by the Mas Construction Company of Manila while the erection of the steel superstructure was done by Mr. A. G. Yankey of Occidental Negros, who also furnished the structural steel.

Talaban Dacu Bridge, Occidental Negros Province.—This bridge consists of fourteen 9-meter slab and girder spans on concrete piles. It was completed and opened to traffic on June 9, 1927.

Bagacay Bridge, Occidental Negros Province.—The work on this bridge consisted in the furnishing and erection of two steel trusses on an old concrete pier and abutments in the Binalbagan River on the Hinigaran–Isabela Road. This work was contracted by Mr. A. G. Yankey and completed in November, 1927.

Malogo Bridge, Occidental Negros Province.—The construction of this bridge was done under contract with Mr. A. G. Yankey and the

Malogo Bridge, Km. 31.8, Bacolod North, Occidental Negros

project was completed about the middle of October. This bridge is a standard reinforced concrete slab and girder type, consisting of thirteen 8-meter spans, on concrete piles.

Ilog Bridge, Occidental Negros Province.—This bridge consists of two steel truss spans on concrete piers, and two reinforced concrete slab and girder approach spans. Construction work is being done by Mr. A. G. Yankey, who at the end of the year had completed one middle pier and the south abutment and erected the steel superstructure on same.

San Fernando Bridge, Pampanga Province.—This bridge is a reinforced concrete arch with timber pile foundation, having a span of 22 meters, with 6-meter clear roadway, and 1-meter sidewalks. It is being constructed by contract with Mr. Juan Ferrer, and is located on the Manila–Tarlac Road, within the municipality of San Fernando, the capital of the province.

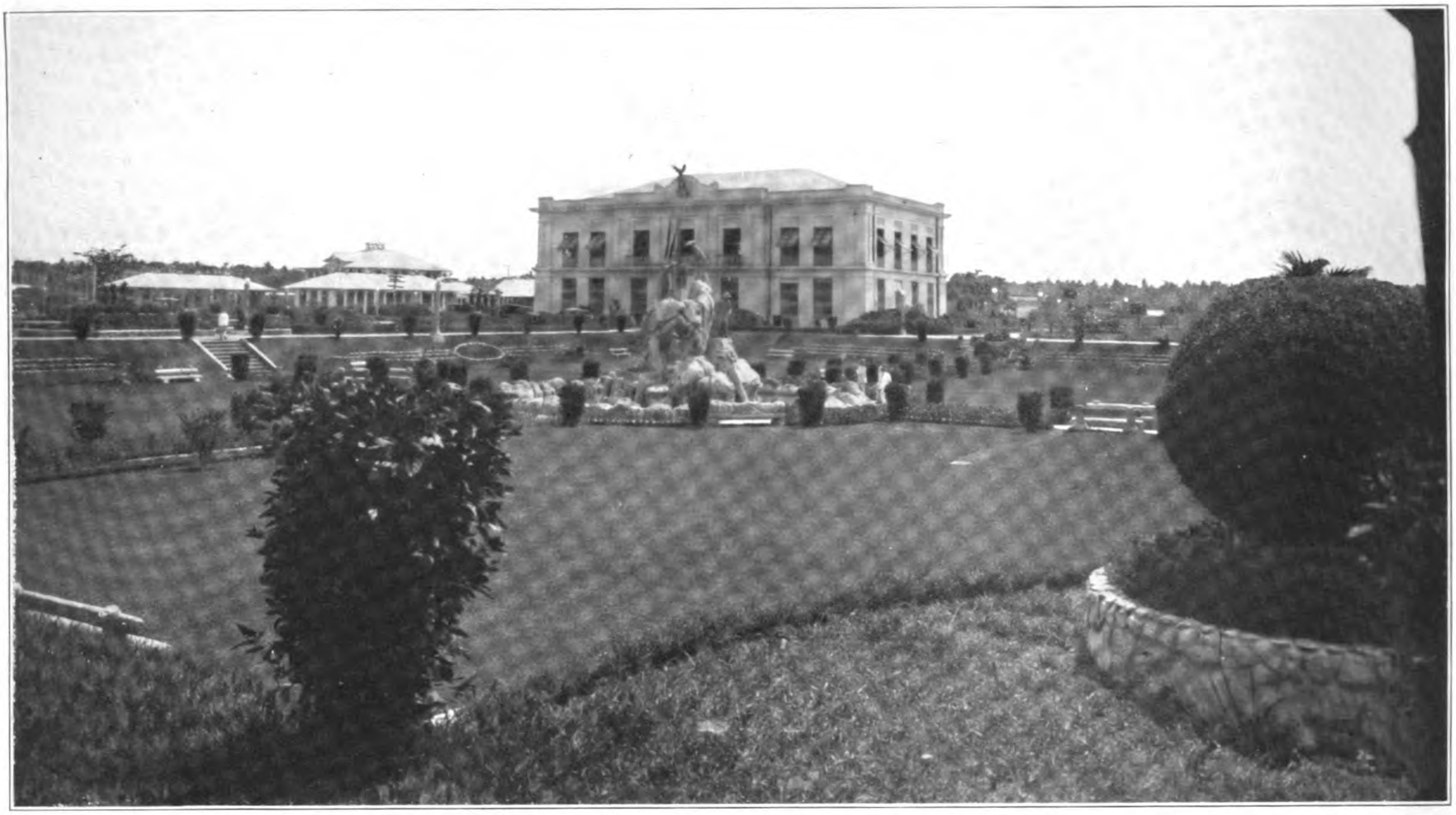
Plaridel Bridge, Pangasinan Province.—This bridge consists of thirteen 160-foot steel spans on 12 concrete piers and 2 abutments, with timber pile foundations. The construction of the substructure was done under contract with Mr. Wm. Anderson for the sum of ₱134, 944 in 160 days' time. The Atlantic, Gulf and Pacific Company furnished the structural steel at Manila, in 220 days' time. The erection of the steel superstructure and the construction of the reinforced concrete floor slab, including the painting of the bridge, was also done by Mr. Wm. Anderson of Manila for the lump sum of ₱129,500. The project was completed in September, 1927.

Ibayo Bridge, Rizal Province.—This bridge was built by contract with Mr. Marion E. Martin, and was completed on September 17, 1927. It consists of twelve 5.73-meter spans with wooden superstructure on reinforced concrete pile bents.

Table VIII gives a complete list of permanent bridges partially or completely constructed during the year 1927.

TABLE VIII.—*Permanent bridges partially or completely constructed during the year 1927*

Province	Name	Bridge No.	Type	Span in meters or feet	Roadway in meters or feet	Estimated cost	Total expenditures and liabilities	Percentage of work
Abra	Sinalang	449.3	Steel truss	1–160′	4.80	₱136,000.00	₱79,195.71	100
Albay	Oas		Suspension	2–63′ 180′	5′ 8″	13,492.72	13,097.13	80
Batangas	Lagnas	118.5	Concrete arch	22 m	4.88	61,000.00	60,045.74	99
Do.	Hagonoy	119.6	Do.	15 m	4.88			
Bukidnon	Malopali	20.61	Suspension	120′	10′8″	18,800.00	18,330.11	100
Cavite	Noveleta	26.24	Steel truss	80′	4.88	31,000.00	29,519.88	40
Cebu	Mananga	16.80	Suspension	200′	9′4″	35,000.00	30,428.29	100
Camarines Norte	Talisay	10.04	Steel truss	80′	16′	39,800.00	37,539.12	100
Ilocos Sur	Butac	388.46	Suspension	160′	9′2″	30,000.00	28,394.13	100
Laguna	Malaunod	91.0	Concrete pile	11 m	4.88	26,163.10	26,092.70	45
La Union	Borobor	346.24	Do.	4–9 m	4.88	27,000.00	24,641.28	100
Occidental Negros	Hinigaran	57.1	Do.	15–9 m	4.88	140,000.00	136,505.06	88.7
Do.	Bago	23.1	Steel truss	650′	5.18	202,348.01	201,931.16	100
Do.	Talaban Dacu	75.8	Concrete pile	14–7 m	4.28	89,000.00	88,144.60	100
Do.	Bagacay	47.6	Steel truss	2–120′	4.88	48,000.00	47,994.99	100
Do.	Malogo	31.8	Concrete pile	13–8 m	4.88	80,000.00	79,772.53	100
Do.	Ilog	94.1	Steel truss	2–	4.88	193,000.00	192,966.73	73
Pampanga	San Fernando	72.20	Concrete arch	22 m	4.88	49,000.00	46,530.64	8
Pangasinan	Plaridel	192.24	Steel truss	13–160′	4.88	553,978.77	522,609.74	100
Rizal	Ibayo		Concrete pile	12–5.73 m	9′4″	16,000.00	16,697.07	100



Provincial grounds and buildings, Lucena, Tayabas

Durable bridges and culverts in existence

Fiscal year ending	All durable structures			
	Total		Increase	
	Number	Span in meters	Number	Span in meters
December 31—				
1913 (6 months)	5,901	21,034.60	190	....
1914	6,206	23,973.13	305	....
1915	6,640	25,068.90	434	....
1916	7,156	27,025.13	516	....
1917	7,370	28,336.86	214	....
1918	7,426	28,799.84	54	....
1919	7,491	29,106.58	65	....
1920	7,521	28,779.84	30	....
1921	7,481	29,392.57	[a] 40	....
1922	7,562	29,693.74	81	....
1923	7,586	30,214.37	24	446.62
1924	7,613	30,516.89	27	222.15
1925	7,779	31,226.94	166	404.86
1926	7,753	31,696.71	[a] 26	[b] 209.74
1927	7,831	33,013.76	78	1,207.05

[a] Decrease in number of structures.
[b] Increase in meter spans.

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick, and all substantial stone structures, whether of adobe or other material. The increase of 78 structures includes those actually completed during the year as well as those which should have been previously reported minus structures reported missing for the first time. The above figures are obtained from semiannual reports of district engineers.

BUILDINGS

Manila

While a number of projects of considerable magnitude was started during the year, only two minor building jobs were finished, viz., the addition to Normal Hall and the second story of the Bureau of Lands bodega.

Reinforced concrete structures in existence

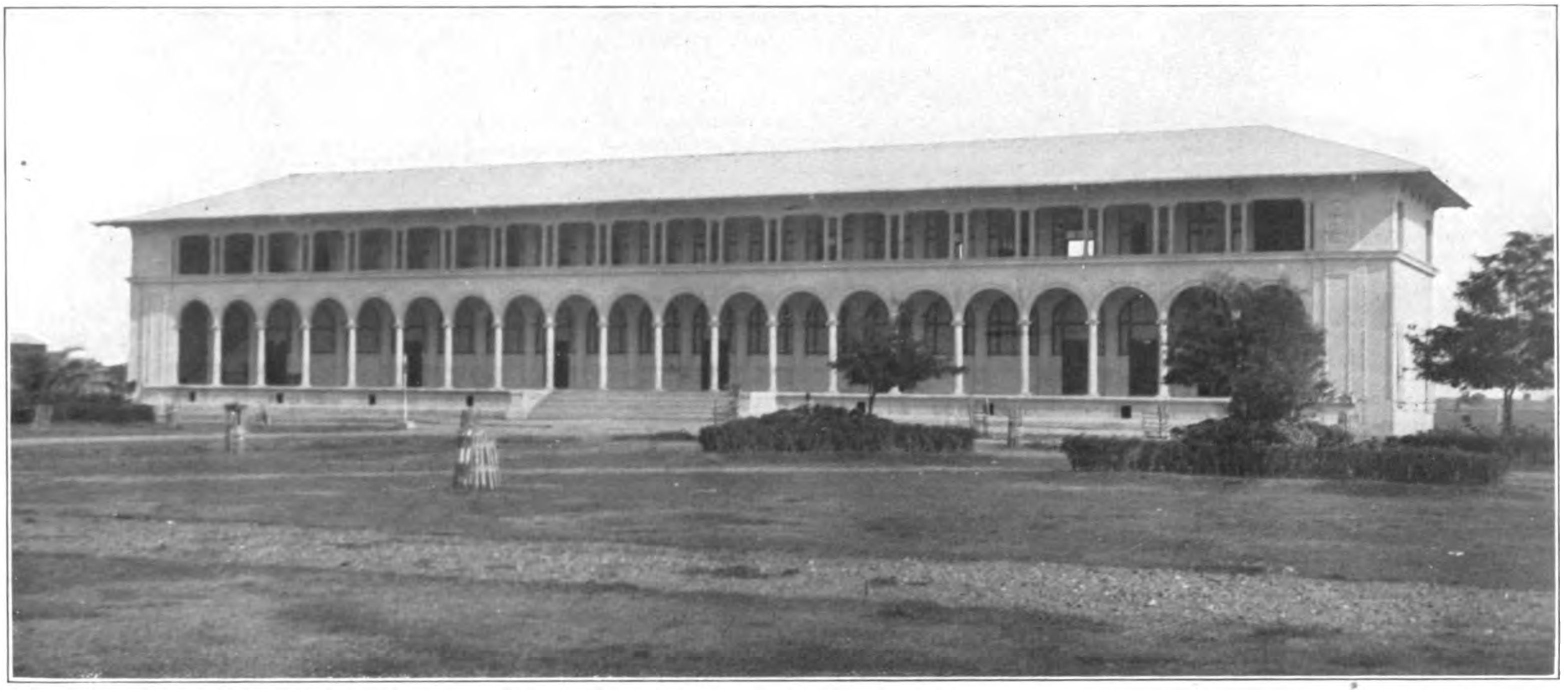
Fiscal year ending	Total number	Total meters span
December 31—		
1913 (6 months)	3,046	11,984
1914	3,247	13,071
1915	3,690	14.416
1916	3,973	15.297
1917	4,138	16.420
1918	4,233	18,672
1919	4,276	16,714
1920	4,302	16.938
1921	4,314	17,280
1922	4,366	17,684
1923	4,400	18,045
1924	4,428	18,413
1925	4,575	18,894
1926	4,597	19.236
1927	4,653	19.664

NOTE.—All reinforced concrete structures were built under American administration, together with a large number of steel and other classes of construction.

The former is a two-story concrete "ell," providing a dining room on the first floor and dormitory space on the second. It has a G. I. roof and proper light, water and toilet equipment. The work was done by contractor Manuel Palma at a cost of ₱60,500.

The small bodega of the Bureau of Lands in the rear of the Oriente Building was improved by raising the roof, intact, and adding a second floor. This small project was done by contract by the International Construction Works at a price of ₱10,000.

Several large projects were started, of which the Normal Training School Building, on Ayala Boulevard, was the only administration job. This three-story concrete school building was 98 per cent completed at the close of the year and could have been occupied at that time. It was erected under the immediate supervision of Mr. Lorenzo Vidad, overseer, whose work is deserving of the highest commendation.



Provincial High School, Cabanatuan, Nueva Ecija

Contracts were let to Mr. Feliciano Nable for the erection of the first units of the new Insular Psychopathic Hospital at San Felipe Neri. These are the Male and Female Receiving Ward Buildings, respectively. They are two-story reinforced concrete structures with G. I. roofs, specially designed for the examination and treatment of the insane. Their combined contract cost is ₱200,498. This contract was approximately 75 per cent completed at the end of the year. An artesian well was also drilled by the Bureau to supply water to the institution and a 12,500-gallon steel tank on a 67-foot tower was ordered from the Atlantic, Gulf and Pacific Company. The Designing Division also ordered the electrically driven pump required.

For the adjoining Government Orphanage at Welfareville, contract was let late in the year for the construction of a combined kitchen and mess hall. The work was awarded to Mr. Ramon Borromeo at ₱20,672 and was 50 per cent completed as of December 31st.

Contract was awarded to Messrs. Gotauco & Co., for the construction of a reinforced concrete pavilion at the Philippine General Hospital to house contagious disease patients. The bid was ₱69,523 and work was started late in the year. Contract for a similar structure at San Lazaro Hospital was let to Mr. Juan Ferrer for ₱75,000. Work on this building was also started before the close of the year.

The completion of the Manila Post-Office building was advertised for bids opened on November 28, 1927, but contract could not be awarded until 1928.

Contract for the installation of elevators in the Legislative Building was let to the Pacific Commercial Co., at ₱28,721.35 and the work had not been completed at the end of the year.

PROVINCES

The most important buildings completed in the provinces during the fiscal year 1927 are as follows:

Nueva Ecija High School, Nueva Ecija Province.—This building is a reinforced concrete structure, 23.80 meters by 95.80 meters by 11.70 meters, and is similar to the Manila Normal School in design. It provides for one office room, one library room, and fourteen classrooms. Its construction was started in January, 1921, but due to shortage of funds, work had to be temporarily suspended until 1926, when an Insular appropriation was made available. The building was completed in the month of February, 1927, and was immediately turned over to the school authorities. The total cost amounted to ₱237,101.51.

Pangasinan High School, Pangasinan Province.—Out of the sale of bonds for the Province of Pangasinan, the amount of ₱300,000 was set aside for the construction of the Provincial High School. The plan calls for three main buildings, two of which are to be used exclusively for classrooms, and the third for assembly and library. The construction of the first two buildings, which are of the Pasig Type, was started in September, 1926, and completed in June, 1927, at a total cost of ₱214,735.65, including the electrical installation. Two reinforced concrete outhouses 6.30 meters by 15.50 meters by 6 meters provided with 18 flush-toilets each, and a

Provincial High School, Lingayen, Pangasinan

Batangas Provincial Hospital, Batangas

reinforced concrete septic vault, were also constructed and completed at a cost of ₱15,497.

Pangasinan Normal School, Pangasinan Province.—With an Insular appropriation of ₱90,000, plus provincial and municipal aid of ₱50,000 and ₱10,000, respectively, the construction of the Pangasinan Normal School in the municipality of Bayambang was authorized. The school consists of two reinforced concrete buildings, one for academic classes and the other for the Training Department. The Academic Building is of the Pasig Type, while the Training Building is a standard type No. 10–A. The construction of the two buildings was started in July, 1926, and completed in May, 1927. The total cost, including surcharges and inspection, amounted to ₱150,875.76.

Urdaneta Central School, Pangasinan Province.—This building consists of a complete Standard Plan No. 10–A with ten rooms added to the right rear wing and one to the left rear wing. Its construction was undertaken by Contractor F. Nable, in October, 1926, and completed in July, 1927, at a total cost of ₱81,052.83, including surcharges.

Pagbilao Presidencia, Tayabas Province.—This is a two-story reinforced concrete building with galvanized iron roof, 17.50 meters by 11.50 meters. Its construction was started in October, 1926, by contract and was completed in May, 1927. The contract price for the building alone was ₱29,900, but the total cost, including the sanitary installation, inspection and surcharges, amounted to ₱35,167.

Tayabas Provincial Bandstand, Tayabas Province.—This bandstand, a very original design, is a reinforced concrete structure consisting of seven irregularly shaped columns supporting a grotto-like dome for a roof, and with concrete floor slab capable of supporting a live load of 200 pounds per square foot. The construction of the grotto finish was accomplished by masons aided by the cement gun outfit of the Bureau of Public Works.

Laguna Provincial Hosiptal, Laguna Province.—The work accomplished is the construction of Stage II and Kitchen, standard plan for provincial hospitals. The contract was awarded to Mr. M. S. Concepcion, contractor of Manila, who completed the buildings during the first quarter of the year. The contract price was ₱57,397 and the total cost, including surcharges, inspection, etc., was ₱73,361.29.

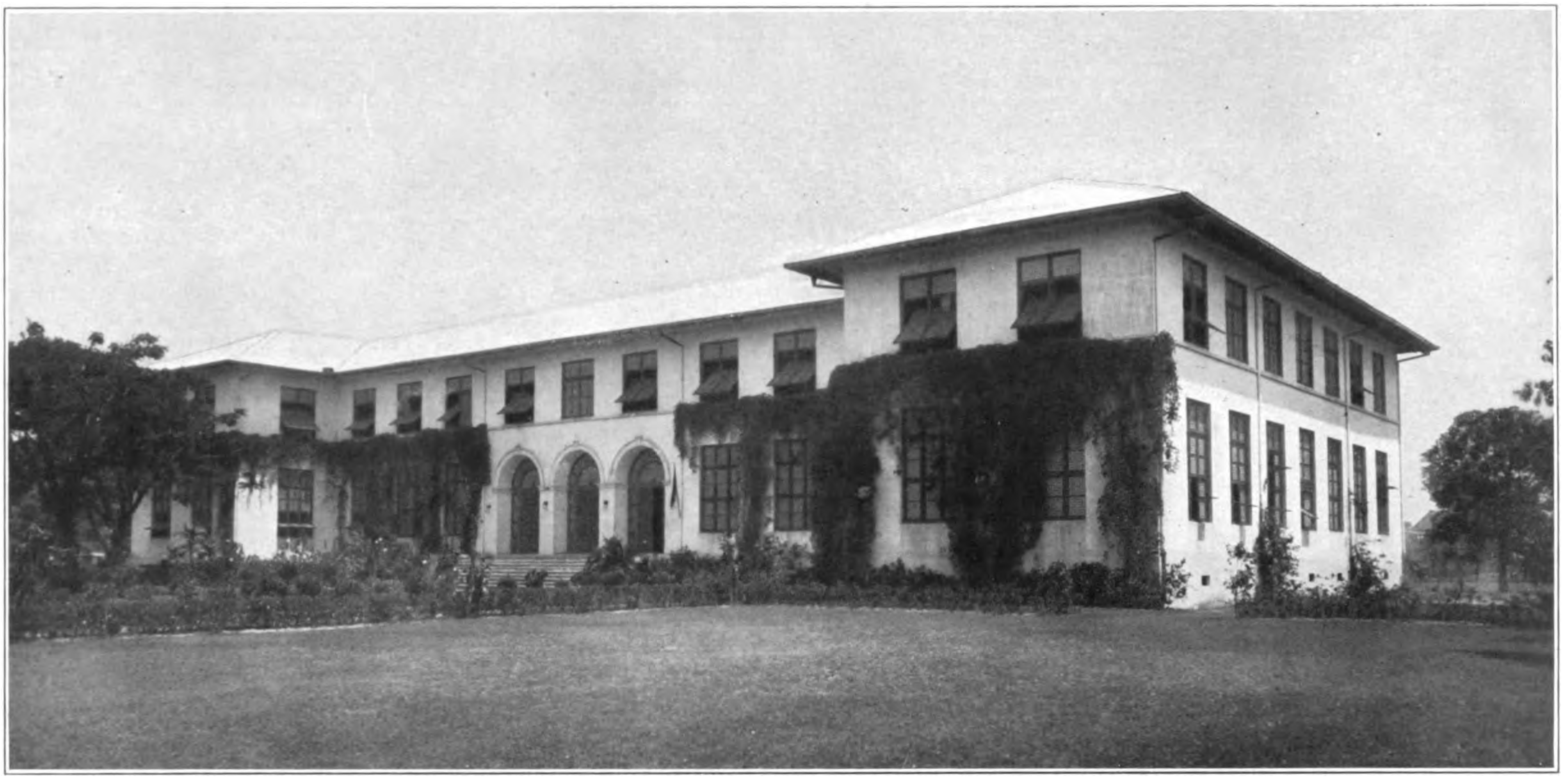
Batangas Capitol Building, Batangas Province.—The construction of this building, a reinforced concrete structure of special design, consisting of an 18.94 meters by 29.70 meters, two-story main building, two (2) one-story wings, 10 meters by 34.30 meters each, and two (2) one-story end wings, 9.75 meters by 35.10 meters plus 16.20 meters by 10.80 meters each, the whole forming a U-shaped group with a suitable terrace in front, was 75 per cent completed at the end of the year. The work on the construction of the central pavilion and wings was undertaken in 1925 and 1926, and completed under contract by Manuel G. Palma for the building proper, and Cacho & Hidalgo for the electric wiring, at a total cost of ₱251,755.29. This year, upon the release of ₱120,000 loan funds from Act No. 3335, the construction of the two end wings was undertaken by administration, the electrical wiring work being let to contract. By the end of the year, most of the concrete work was completed. The terrace fill and paving were also partly completed, including the grading of the grounds. This building has been provided with water and light service, the construction and installation costs of which were equally shared by this project and the adjoining Provincial Hospital. The combined plant cost ₱40,000. This building, when completed, will be unusually impressive, with ample grounds for park purposes and landscape gardening. Set well back from the street, it has an imposing appearance of dignity and retirement in keeping with the purpose for which it was erected. It is expected that the building will be completed by April, 1928.

Batangas Provincial Hospital, Batangas Province.—The construction of this building, a one-story reinforced concrete structure, standard plan for 20 to 30 beds, consisting of a main unit 26 meters by 26 meters with court inside, and an addition at the rear for the kitchen and dining room, was completed at the end of the year, and the hospital will be formally opened in January, 1928. The contractor for the building was Feliciano Nable of Manila, and for the electrical work, the Mora Electric Company, Inc. The building will be furnished with water and light by a ₱40,000-plant, now ready for service, the construction and installation costs of which were equally shared by the Hospital and Capitol projects. The appropriation for this project was ₱113,559.54, and the total cost was ₱83,776.10.

Tuguegarao Elementary School, Cagayan Province.—This school building is a Bureau of Education Standard Plan No. 10–A, consisting of fourteen (14) classrooms, one (1) library, and one (1) office and storeroom. The contract was awarded to Mr. Fortunato Concepcion, contractor, Pasig, Rizal, in the amount of ₱72,200 and the building was completed on November 16. The total cost of the building, including surcharges, inspection, etc., was ₱84,019.23.

Hinigaran School, Occidental Negros Province.—This is a Bureau of Education Standard Plan No. 10, two-story semipermanent school building, consisting of twelve (12) classrooms. The contract was awarded to Mr. Uy He Sing for ₱30,000 and was completed on

Municipal Building, Victoria, Tarlac



School for Deaf and Blind, Pasay, Rizal

July 15. The total cost of the building, including surcharges and inspection, was ₱32,265.63.

La Carlota Market, Occidental Negros Province.—This structure is 30 meters by 43.5 meters, Standard Plan, Type A. The construction work was done by contract for ₱28,994, and was completed on July 25th. The total cost of the building and market tables, including surcharges, inspection, etc., was ₱39,600.79.

Boac Capitol Building, Marinduque Province.—The construction of this building (Dumaguete Type) was awarded on May 3, 1927, to Contractor Yu Cheng Tian of Manila for ₱95,239 for the building complete, excluding the two ornamental concrete standards at the front entrance, and the installation of electrical fixtures. The total appropriation is ₱105,500. Approximately 60 per cent of the work was completed at the end of the year. This is a two-story reinforced concrete building, 18 meters by 31 meters, with wooden floors and partitions.

Table IX gives a complete list of the school buildings undertaken during the year, with their cost and principal dimensions.

Table X is a list of temporary school buildings constructed during the year.

Table XI shows the hospital buildings constructed during 1927, with their cost and principal dimensions.

Table XII is a tabulation of market buildings and tiendas with their cost and principal dimensions.

Table XIII is a tabulation of presidencia buildings, their cost and principal dimensions.

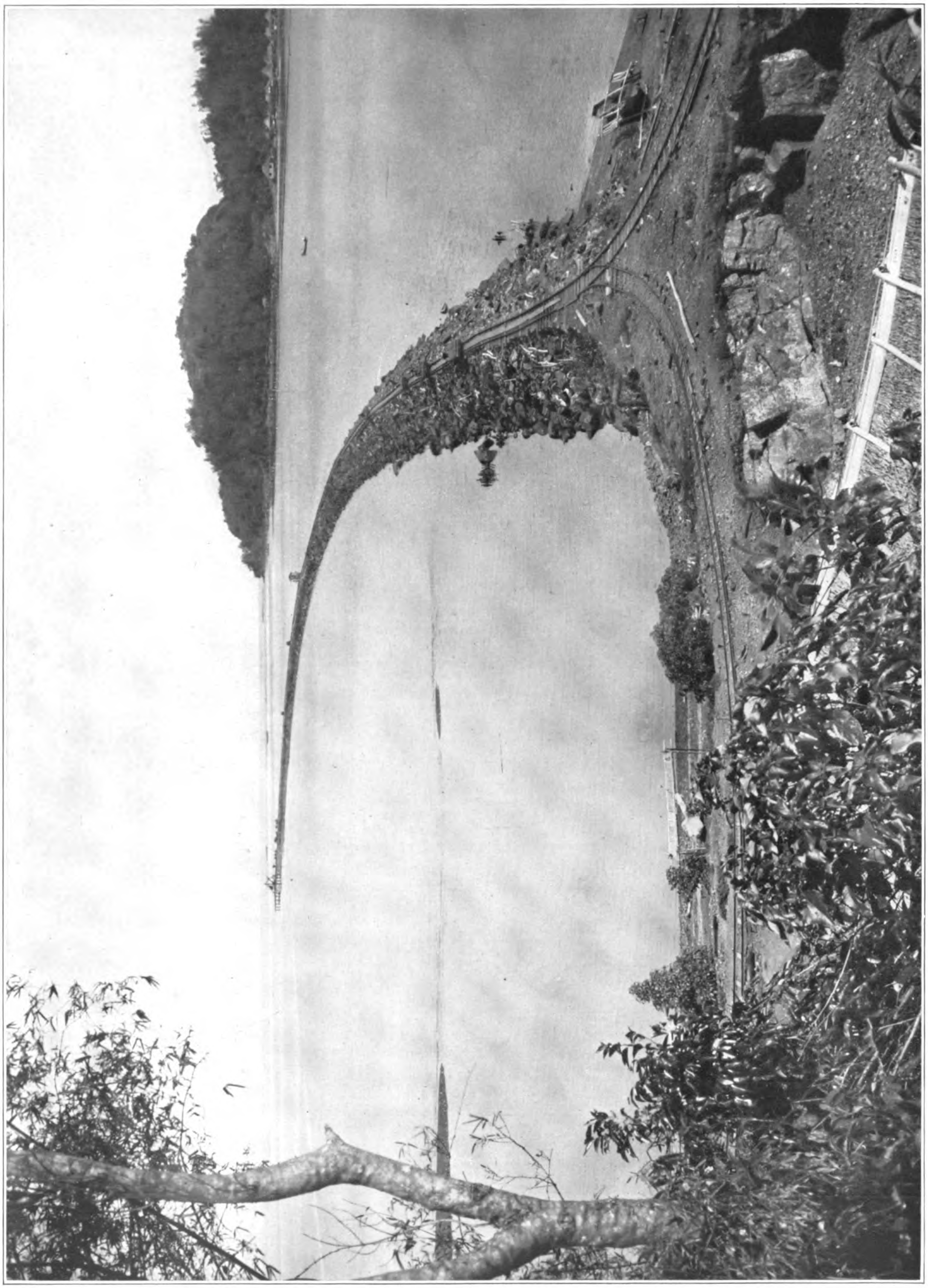
Table XIV is a statement of miscellaneous buildings undertaken during 1927.

TABLE IX.—*School Buildings*

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Albay	Guinobatan	1	Wood with G. I. roof, 6 rooms; B. E. Standard Plan No. 10, semi-permanent.	14.2 ×36.2	3,405.53	₱18,190.54
	Polangui	1	Wood with G. I. roof, 6 rooms; B. E. Standard Plan No. 10, semi-permanent.	14.2 ×36.2	3,405.53	17,034.68
	Pandan	1	Wood with G. I. roof, 6 rooms; B. E. Standard Plan No. 10, semi-permanent.	14.20×36.2	3,405.53	16,918.97
	Tiwi	1	Wood with G. I. roof, 7 rooms; B. E. Standard Plan No. 10, semi-permanent.	14.2 ×43.20	3,597.89	21,195.66
	Daraga	1	Concrete and wood with G. I. roof; Plan No. 10-A	12.25×20.0 11.70×24.9 11.70×17.9	6,368.2	41,900.00
	Oas	1	Wood with G. I. roof, 7 rooms; Plan No. 10, semi-permanent.	14.20×43.20	3,597.9	23,130.18
	Ligao	Domestic Science	Wood with G. I. roof; Plan No. 2	11.20×17.20	1,337.46	12,600.11
	Guinobatan	School building	Wood with G. I. roof, 2 rooms; Plan No. 10, semi-permanent.	12.20×14.20	1,243.00	7,237.00
Antique	Bugason	1	Wood with G. I. roof, 6 rooms, B. E. Stardard, semipermanent.	10.7 ×50.2	3,830.86	22,261.53
City of Baguio	Baguio	1	Wood with G. I. roof	15.45× 8.30	689.62	2,785.26
	Do	Additional	Wood with G. I. roof, addition to Training School	2-12.0 ×10.50	1,260.00	8,625.21
	Trinidad	do	Wood with G. I. roof, addition to Trinidad Farm School	11.50×21.0	845	8,000.00

TABLE IX.—*School Buildings*—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
Batangas	Tanauan	Domestic Science	Wood with G. I. roof, B. E. Plan No. 3	3.50× 1.0 7.0 ×12.50	525.25	₱5,530.00
	Tuy	do	Wood with G. I. roof	3.50× 1.0 7.00×12.5	525.25	4,700.00
	Tuy	Additional rooms	Concrete and wood with G. I. roof	2-7.20× 9.20	947.04	9,705.42
	San Jose	Domestic Science	Wood with G. I. roof, B. E. Plan No. 3	3.50× 1.0 7.0 ×12.5	525.25	4,406.05
	Calatagan	Additional rooms	Wood with G. I. roof	2-12.2 × 7.20	1,374.10	7,046.15
	Malvar	1	Wood with G. I. roof, domestic science	3.50× 1.0 7.0 ×12.5	525.25	4,755.70
	Do.	Annex	Wood with G. I. roof, 2 rooms, B. E. Standard Plan No. 10	9.20×18.20	1,256.34	6,125.42
	Bolbok	1	Wood with G. I. roof, 4 rooms No. 10 B. E. Standard	12.20×28.0	2,323.05	13,045.69
	Talaga, Tanauan	do	Concrete and wood with G. I. roof	7.0 × 9.0	521.17	8,409.43
	Assis, Bauan	1	Wood with G. I. roof, 3 rooms of Plan No. 10	21.20×28.0	1,738.3	9,838.01
	Tanauan	1	Concrete and wood with G. I. roof, 6 rooms of Plan No. 10-A.	28.0 ×12.20	3,749.05	24,383.44
	Nasugbu	1	Concrete and wood with G. I. roof, 3 rooms of Plan No. 10-A	21.2 ×12.20	1,693.40	12,744.24
Bohol	Ubay	Additional room	Concrete and wood with G. I. roof, B. E. Standard Plan No. 7.	11.20× 7.20	582.58	5,170.06
	Antequera	1	Wood with G. I. roof, semi-permanent	14.0 ×39.0	3,693.57	18,796.42
	Lila	1	do	14.15×12.15	1,246.44	6,516.63
	Panglao	1	Masonry and concrete with G. I. roof (reconstruction)	30.95× 8.43	1,504.64	6,134.84
	Talebon	1	Wood with G. I. roof, B. E. Standard Plan No. 10, semi-permanent.	12.0 ×28.0	2,377.96	11,949.29
Bukidnon	Malaybalay	Agricultural school	Wood with G. I. roof, agricultural school	32.0 × 9.0	1,995.2	13,000.00
Bulacan	Hagonoy	1	Wood with G. I. roof, B. E. Standard Plan, semi-permanent.	21.0 ×12.0	1,697.0	8,094.06
	Malolos	Annex	Wood with G. I. roof	50.0 ×14.0 2-11.0 ×14.0	3,506	21,500.00
	San Miguel	Domestic Science	Wood with G. I. roof, B. E. Standard Plan No. 3	12.5 × 7.0		4,500.00
	Polo	1	Wood with G. I. roof, B. E. Standard Plan No. 10	28.0 ×12.0		11,519.26
Cagayan	Bagao	1	Wood with G. I. roof, B. E. Standard Plan No. 10, semi-permanent.	28.20×12.20	2,798.02	8,992.78
	Buguey	1	Concrete and wood with G. I. roof, B. E. Plan No. 10-A	28.50×12.25	2,624.60	28,906.07
	Tuguegarao	Normal School	Wood with G. I. roof, B. E. Plan No. 10, semi-permanent	28×12.30 17.70×11.20	4,066.71	15,696.84
	Tuguegarao	Central School	Concrete and wood with G. I. roof, B. E. Standard Plan	2-30.90×11.70 1-28.00×12.25	8,935.8	84,019.23
Camarines Norte	Basud	School	Wood with nipa roof	32.2 × 9.20	2,001.68	3,671.49
Camarines Sur	Buhi	do	Wood with G. I. roof	12.3 ×21.10	1,947	11,275.58
	Iriga	do	Concrete and wood with G. I. roof, B. E. Standard Plan No. 10-A.	12.25×28.25	2,504	17,454.03
	Iriga	Additional	Concrete and wood with G. I. roof, addition to Plan No. 10-A.	11.7 ×24.7	2,101.6	13,022.37
	Sagnay	School building	Wood with G. I. roof	12.5 ×21.10	1,947	9,614.39
	Tigaon	1	Concrete and wood with G. I. roof, Standard Plan No. 6, modified.	14.20×11.50	1,071.8	9,312.46
Capiz	Capiz	School	Concrete and wood with G. I. roof	11.80×14.20	1,307.59	9,247.63
	Altavas	do	Wood with G. I. roof	12.20×28.20	2,754.49	13,093.47
	Pilar	do	do	12.20×14.20	1,404.30	4,460.36
	Hipona-Pontevedra	do	do	12.20×14.20	1,404.3	4,500.01
	Ivisan	do	Wood with G. I. roof	12.20×28.20	2,754.59	2,785.12
	Kalibo	do	Concrete and wood with G. I. roof	12.2 ×28.20	2,657.33	19,692.18
	Dumarao	do	do	12.20×14.20	1,404.3	6,164.12
	Panay	do	Wood with G. I. roof	12.20×28.20	2,754.49	12,007.07
	Jamindan	do	do	12.20×21.20	2,075.39	9,339.18
Cebu	Cordova	Additional	do	12.0 ×28.0	2,217	12,395.46
Davao	Tugboc	1	Wood with G. I. roof, B. E. Standard Plan No. 3, semi-permanent.	23.0 × 9.0	1,488.6	6,338.83
	Santa Cruz	1	do	28.0 ×12.0	2,382.3	12,611.20
Ilocos Norte	Bangui	School	Wood with G. I. roof, B. E. Standard Plan No. 10	9.20× 7.00 2-9.20×21.20 20.80×12.20	4,244.7	26,351.39
	Dingras	do	Concrete and wood with G. I. roof, B. E. Standard Plan No. 10-A.	12.25×28.6 2-11.7 ×17.90	5,565	41,883.00
	Batac	do	Wood with G. I. roof	12.15×28.15 2-11.15×17.65	3,961.0	20,294.93
	Burgos	do	do	12.15×14.15	956.38	7,197.12
Ilocos Sur	Santa Cruz	do	Wood with G. I. roof, semi-permanent	50.2 ×14.2	5,507	25,749.75
	Bantay	do	Brick and wood, reconstruction of old building	28.25×17.61	2,955	3,977.42
Iloilo	Janiuay	do	Wood with G. I. roof, semi-permanent	12.0 ×28.0	2,549.7	12,477.55
	San Joaquin	do	Concrete and wood with G. I. roof, B. E. Standard Plan No. 5.	10.0 ×45.4	2,848.0	24,114.21
	Dueñas	1	Concrete and wood with G. I. roof, Plan 10A	12.0 ×28.0	2,472.9	15,588.24
	Buenavista	1	do	12.0 ×21.0	1,854.6	14,311.59
	Arevalo	1	do	12.0 ×21.0	1,854.6	12,383.80
	Pavia	1	Old masonry and wood, reconstruction of old Spanish building.	12.37×42.0	5,429.2	12,327.88
	Ilaya-Molo	Additional	Wood with G. I. roof, Plan No. 10, semi-permanent	12.0 × 7.0	643.8	2,326.94
	Baluarte-Molo	do	Wood with G. I. roof, Plan No. 4-A, semi-permanent	9.0 × 9.0	609.0	2,193.59
Isabela	Ilagan	High school	Concrete and wood with G. I. roof	51.3 ×42.2	122,794.6	163,396.46
	Ilagan	Additional	do	28.3 ×11.80	2,506.0	31,503.52
	Echagüe	Shop building	Wood with G. I. roof	24.0 × 6.0 3-6.2 × 8.20	1,056.9	8,992.68
	Gamu	School	Wood with G. I. roof, part of B. E. Standard Plan No. 10	12.0 ×28.0	2,536.0	17,115.26
Laguna	San Pablo	Additional	Concrete and wood with G. I. roof	9.20×11.87	1,600.75	15,612.60
Lanao	Lumbatan	do	Wood with G. I. roof Boys' dormitory Dining room Toilet Kitchen	19.0 × 7.0 12.0 × 7.0 2.5 × 2.5 4.0 × 4.0	1,125.24	13,207.91
Leyte	Cabalian	School	Wood with G. I. roof, 7 rooms; B. E. Standard Plan No. 10, semi-permanent.	29.0 ×24.5	3,996.24	19,015.00
	La Paz	do	do	39.0 ×24.5	3,996.24	20,929.00
	Ormoc	Extension	Wood with G. I. roof, 7 rooms; two-story building	7.0 ×11.50 14.0 ×11.50	2,511.60	15,945.00
	Abuyog	School	Wood with G. I. 4 rooms, B. E. S. P. No. 10, semi-permanent.	28.0 ×12.0	2,209.2	13,518.53
	Palo	do	do	21.0 ×28.0	2,209.2	9,211.00
	Hilongos	do	Concrete and wood with G. I. roof, 4 rooms; B. E. Standard Plan No. 10-a.	12.0 ×28.0	2,076.9	15,674.00
Manila	Manila	Annex	Concrete and tile with G. I. roof,	34.0 ×18.5	5,920.29	60,550.00
Marinduque	Mogpog	1	Concrete and wood with G. I. roof, Plan 10-A	12.0 ×21.0	1,865	14,772.24
	Boac	1	Wood with G. I. roof, semi-permanent Plan No. 10	11.0 ×24.50	1,911	12,712.79
Masbate	San Pascual	1	Wood with G. I. roof, semi-permanent	18.0 ×9.0	972.0	7,301.40



CAPIZ BREAKWATER, UNDER CONSTRUCTION, CAPIZ

TABLE IX.—*School Buildings*—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
Mindoro	Lubang	School	Wood with G. I. roof, 2 rooms of No. 10 semi-permanent	14.0 ×12.0	1,104.6	₱6,333.21
	Vigo	....do	....do	9.0 × 9.0	486.0	3,043.07
	San Jose Naujan	....do	....do	8.0 ×15.0	600.0	1,669.51
Misamis	Oroquieta	1	Concrete and wood with G. I. roof, B. E. S. P. No. 10	28.0 ×12.0	4,126.50	32,744.11
Nueva Ecija	Cabanatuan	Provincial High School	Concrete and wood with G. I. roof, 2 stories	95.80×23.80	15,841.41	237,101.51
Occidental Negros	Bacolod	Extension	Concrete and wood with G. I. roof	11.25×28.0	1,906.25	12,600.00
	Granada	....do	Wood with G. I. roof, semi-permanent	18.0 × 9.0	1,065.15	5,891.23
	Concepcion	School	....do	21.0 ×12.0	1,656.90	6,500.00
	Saravia	Extension	....do	63.0 × 9.0	3,458.70	16,725.50
	Manapla	....do	....do	9.0 ×14.0	888.30	4,683.82
	Maao	....do	Concrete and wood with G. I. roof	11.7 ×35.2	2,639.65	14,730.00
	Napoles	School building	Wood with G. I. roof, semi-permanent	14.0 ×12.0	1,104.6	4,910.00
	J. Sison	....do	....do	14.0 ×12.0	1,104.6	5,338.54
	La Granja	....do	....do	14.0 ×12.0	1,104.6	5,249.19
	La Castellana	Domestic Science	....do	10.0 ×16.0	893.0	5,420.00
	Pontevedra	School building	....do	12.0 ×77.0	5,754.12	24,840.00
	Binalbagan	School extension	Concrete and wood with G. I. roof	9.0 ×18.0	1,043.95	7,440.00
	Talaban	School	Wood with G. I. roof, semi-permanent	14.0 ×12.0	1,104.60	5,579.90
	Libacao	....do	....do	14.0 ×12.0	1,104.60	4,820.00
	Himamaylan	Extension	Concrete and wood with G. I. roof	11.0 ×14.0	1,024.10	7,072.29
	Dalicioso	School	Wood with G. I. roof, semi-permanent	14.0 ×12.0	1,104.60	4,790.00
	Talubangi	....do	....do	14.0 ×12.0	1,104.60	5,098.00
	Cauayan	....do	....do	28.0 ×12	2,212.2	10,547.00
	Silay	Additional	....do	56.0 ×11.8	4,669.0	19,063.58
	Dos Hermanos	1 school building	....do	14.0 ×12.0	1,104.6	5,681.53
	E. Lopez	....do	....do	21.0 ×12.0	1,656.90	8,895.19
	Alegria	....do	....do	14.0 ×12.0	1,104.6	6,475.57
	Toboso	School	....do	39.0 ×14.0	2,945.9	13,270.29
	San Isidro	....do	....do	28.0 ×12.0	2,212.2	11,111.68
	San Carlos	Additional	....do	14.0 ×11.5	900.9	6,206.28
	Hinigaran	1 school building	....do	50.0 ×35.1	7,767.67	32,265.63
	Magallon	Additional	....do	18.0 × 9.0	1,057.3	5,295.60
Oriental Negros	San Enrique	....do	....do	17.5 ×11.0	1,250.6	5,367.75
	Guihulñgan	Additional	Concrete and wood with G. I. roof	11.20×14.20	972.65	9,819.91
	Bacong	1 school building	Wood with G. I. roof, 4 rooms of S. P. No. 10, semi-permanent.	28.0 ×12.0	2,376.26	12,000.00
	Sibulan	Additional	Concrete and wood with G. I. roof, 2 rooms	7.0 ×14.0	1,277.13	8,860.67
	Vallehermoso	1 school building	Wood with G. I. roof, B. E. S. P. No. 10, semi-permanent	50.0 ×17.5	4,906.30	26,071.08
Pampanga	Mabalacat	1	Concrete and wood with G. I. roof, part of Plan No. 20	14.0 ×51.3	5,498.91	36,385.58
Pangasinan	Lingayen	Provincial High School	Concrete and wood with G. I. roof, Pasig type, 2 units		27,421.74	214,735.65
	Bayambang	Normal, academic	Concrete and wood with G. I. roof, Pasig type, 1 unit		13,710.97	150,875.76
		Normal, training	Concrete and wood with G. I. roof, Plan 10–a, 1 unit		7,186.9	
	Urbiztondo	School	Concrete and wood with G. I. roof, B. E. S. Plan No. 2	14.20×39.20	3,702.11	25,217.24
	Napandan	....do	Concrete and wood with G. I. roof, B. E. S. Plan No. 7 4 standard class rooms.	11.60×28.10	1,874.6	13,629.88
	Santa Maria	Domestic Science	Wood and sawali with G. I. roof, semi-permanent	7.98× 9.20	1,270.0	4,448.09
	Aguilar	Additional	Concrete and wood with G. I. roof	9.20×14.10	950.0	7,336.28
	Urdaneta	1 school building	Concrete and wood with G. I. roof, Plan No. 10–A plus 11 additional rooms.		13,968.17	81,052.83
	San Quintin	1 school building	Concrete and wood with G. I. roof, S. P. No. 7 plus 7 additional rooms.	39.20×14.21 11.60×49.20	8,452.08	33,587.08
	San Jacinto	Additional	Concrete and wood with G. I. roof, 2 rooms	9.20×14.20	950.0	6,714.32
	San Manuel	....do	....do	11.50×14.20	1,185.79	6,816.28
	Malasiqui	1 school building	Concrete and wood with G. I. roof, two rooms for shop.	9.20×14.20	1,058.27	7,162.10
Rizal	Pasay	School building	Concrete and wood with G. I. roof, Plan 10–A, 4 rooms.	28.50×12.25	2,635.93	16,239.22
	Pateros	....do	Wood with G. I. roof, 3 rooms of Plan No. 10 semi-permanent.	21.0 ×12.0	3,049.2	10,124.98
	Navotas	....do	Concrete and wood with G. I. roof, 3 rooms S. P. 10–A.	22.50×12.25	2,566.10	14,980.25
Romblon	Despujols	School	Wood with G. I. roof, semi-permanent	10.50×36.00	2,475.62	11,067.16
	Badajoz	....do	....do	9.0 ×32.0	1,872.0	6,994.60
	Odiongan	Farm School	Wood with concrete floor and G. I. roof	7.0 ×21.0	768.12	5,114.79
Sorsogon	Casiguran	School	Concrete and wood with G. I. roof, B. E. S. P. 10–A, 4 rooms.	12.0×28.00	2,285.6	18,546.47
	Donsol	....do	Concrete and wood with G. I. roof, 4 rooms of S. P. 10–A.	12.0 ×28.00	2,285.6	18,092.40
	Irosin	....do	Wood with G. I. roof, 4 rooms of Plan No. 10, semi-permanent.	12.0 ×28.00	2,285.6	11,333.20
	Juban	Addition	Concrete and wood with G. I. roof, 3 additional rooms	9.20×27.10	2,453.2	11,908.81
Surigao	Numancia	School	Wood with G. I. roof, 4 rooms of Plan No. 10, semi-permanent.	12.0 ×28.0	2,234.4	11,431.19
Tarlac	Capas	....do	Concrete and wood with G. I. roof	12.0 ×28.0	2,209.2	16,378.94
Tayabas	Bulanay	....do	Wood with G. I. roof, B. E. S. P. No. 4, modified	2–9.0 ×10.0 18.0 × 8.0	2,031.3	6,539.00
	Pitogo	....do	Wood with G. I. roof, B. E. S. P. No. 10, modified	2–6.0 ×12.0 9.0 ×23.0	2,636.35	7,280.00
	San Vicente, Gumaca	....do	Wood with G. I. roof, 2 rooms only	12.0 ×14.0	1,100.40	6,929.00
	Alabat	....do	Wood with G. I. roof	12.0 ×14.0	1,100.40	2,815.00
	San Narciso	....do	....do	12.0 ×14.0	1,100.40	7,764.00
	Pagbilao	....do	Wood with concrete floor, old presidencia building; reconstruction.	8.0 × 7.0 13.0 ×17.0	2,362.3	7,565.00
	Laguimanoc	....do	Concrete and wood with G. I. roof, Standard Plan No. 10, not painted.	12.0 ×20.80 7.0 × 9.0	1,978.79	15,237.00
	Lucena	Addition	Concrete and wood with G. I. roof, Standard Plan No. 10, 3 rooms.	12.0 ×21.0	933.71	13,262.00
	Do	Domestic Science	Wood with G. I. roof	7.0 ×12.50	426.56	6,665.00
	Casiguran	School	....do	7.0 ×12.0	504.0	3,913.00

TABLE X.—*Temporary school buildings*

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Camarines Norte	Basud	School	Wood with nipa roof	32.2× 9.20	2,001.68	₱3,671.49
Mindoro	Isla de Cabra	....do	Wood with cogon grass roof	8.0×15.0	540.0	1,260.75
Iloilo	Iloilo	Addition	Wood with nipa roof	9.0×41.0	2,703	4,496.54
	Mandurriao	School	....do	9.0×41.0	2,703	4,692.50

TABLE XI.—*Hospitals*

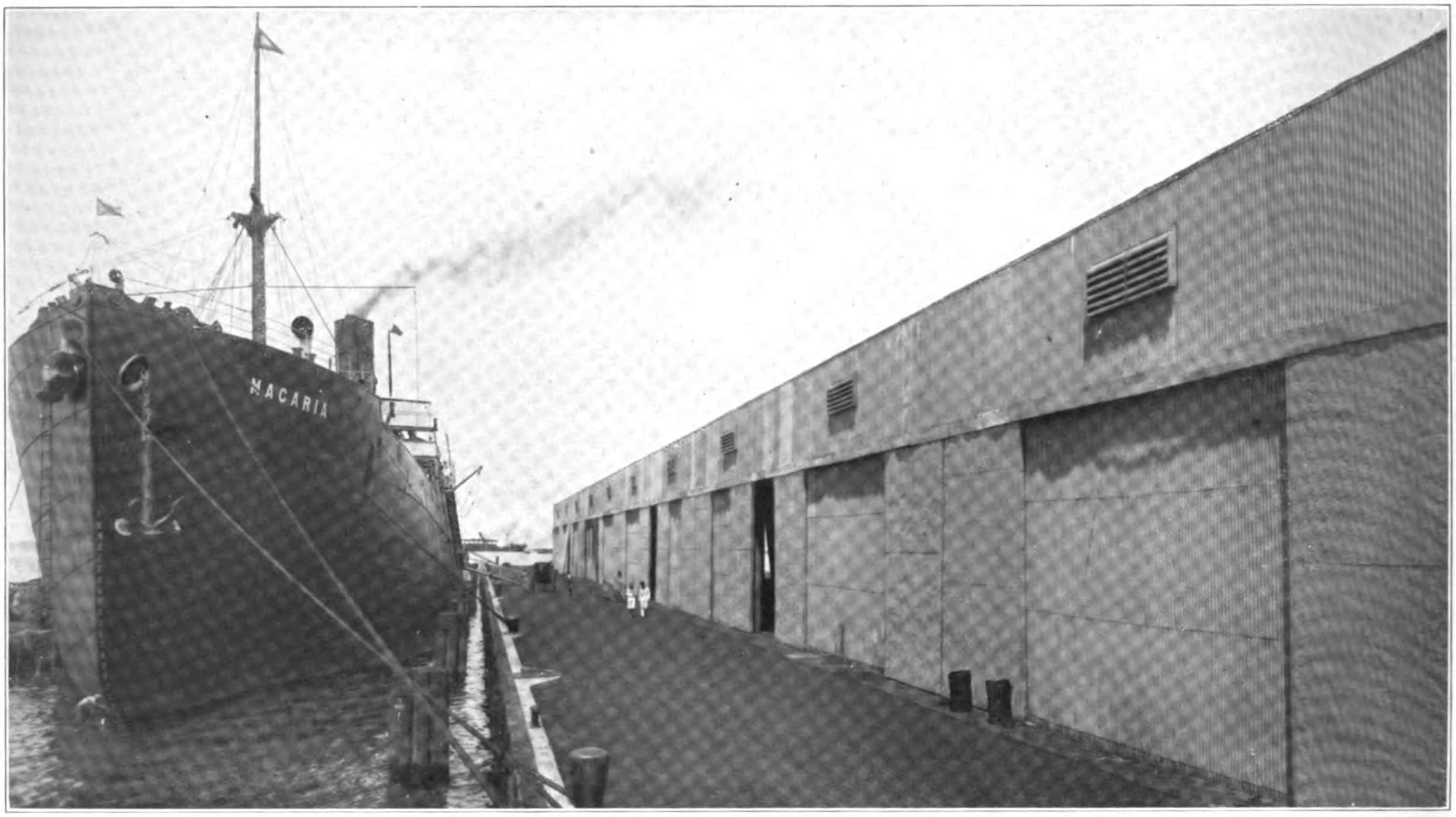
Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Albay	Legaspi	Provincial Hospital	Concrete and wood with G. I. roof (main building 2-story)	14.24×37.54	6,168.86	₱80,450.00
			Concrete and wood with G. I. roof, kitchen	7.00× 9.00	541.10	4,947.00
			Galvanized iron with G. I. roof, power house complete with machinery	5.00× 9.30	254.58	20 332.69
Albay	Virac	Dispensary	Wood with G. I. roof, Stage I of Stand. Prov. Disp	9.50× 5.50	295.92	2,724.24
Batangas	Batangas	1	Concrete and wood with G. I. roof, Provincial hospital	26. 0×26.0 2.40×60.0 2-11.70× 7.10	5,199.47	85,629.91
Cotabato	Cotabato	1 quarters	Wood with G. I. roof, physician's quarters	8.0 ×10.0	804.0	3,350.00
Ilocos Norte	Bangui	1	Wood with G. I. roof, emergency hospital	4.00× 9.50 7.00× 6.00 1.50× 9.50	412.76	5,841.82
	Batac	1	....do	8.00× 8.00 2.00× 3.00 2-2.00× 1.50 1.50× 8.00	581.83	7,855.88
Laguna	Santa Cruz	1 stage 2	Concrete with G. I. roof, administration building	9.00×15.18	3,673.1	59,754.27
		1 stage 3	Concrete with G. I. roof, kitchen	5.80× 9.60	592.4	13,607.02
		1 quarters	Wood with G. I. roof, nurses' quarters	7.00×12.50	680.1	6,320.63
La Union	Luna	1	Wood with G. I. roof, Standard Dispensary Stage I	5.50× 9.50	324.21	2 708.59
	Agoo	1	....do	5.59× 9.50	324.21	2,616.56
Mountain Province	Kabugao	1	Wood and sawale partition with G. I. roof, dispensary	9.50×11.50	589.9	5,132.82
Occidental Negros	Bacolod	Extension	Wood with G. I. roof, Puericulture Center Hospital	6.00×12.00	789.9	5,20.00
	Bacolod	1	Wood with G. I. and concrete floor morgue for provincial hospital	7.50×30.0	1,406.25	6,050.00

TABLE XII.—*Market buildings and tiendas*

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Albay	Tabaco	Market building	Concrete with G. I. roof	15.0 ×25.0	3,216.3	₱34,352.78
		Market tiendas	Concrete and wood with plain G. I. roof, Standard	4.4 ×44.70	867.3	
		....do	....do	4.4 ×20.70	300.0	
	Oas	....do	....do	4.40×44.70	867.3	14,059.24
	Bacacay	Market building	Concrete with G. I. roof	18.0 ×26.0	1,893.15	12,985.36
Batangas	Lipa	Market	Concrete and wood with plain G. I. roof, Standard	40.8 ×18.3 33.65×11.15	6,054.78	20,629.15
	Batangas	Market tiendas	Concrete and wood with plain G. I. roof, Spl. plan	12.20×25.70	1,736.73	8,561.75
Bohol	Loay	....do	Concrete with G. I. roof, special plan	15.0 ×39.0	2,781.15	14,012.68
Camarines Norte	Daet	.do	Concrete with plain G. I. roof, Standard	2-34.7 × 5.4	1,710.9	20,858.73
Camarines Sur	Calabanga	Market building	Concrete with G. I. roof, Standard	24.6 ×39.7	6,407.0	22,776.86
	Lagonoy	.do	Concrete with G. I. roof, Standard type	21.6 ×36.7	4,141.4	19,638.01
Capiz	Capiz	Market tiendas	Concrete and wood with G. I. roof	4.15×24.15	512.13	3,378.36
Ilocos Norte	Sarrat	Market building	Concrete with G. I. roof, Standard type B	18.0 ×34.0	2,908.5	16,831.05
Ilocos Sur	Narvacan	.do	Concrete with G. I. roof	20.0 ×12.0	1,875.0	16,012.96
Lanao	Kolambugan	.do	Concrete with G. I. roof, special plan	23.58×10.76	1,042.89	2,720.11
Masbate	Masbate	.do	Concrete with G. I. roof, Standard	12.0 ×21.0	928.8	7,909.20
Occidental Negros	Bacolod	.do	Concrete with G. I. roof, Standard type B	24.0 ×42.8	5,104.59	31,273.00
	Murcia	.do	Concrete with G. I. roof, Standard type A	21.0 ×36.1	3,283.21	21,637.10
	Isabela	.do	Concrete with G. I. roof, Standard type B	24.0 ×42.8	5,104.59	26,147.59
	Pulupandan	.do	Concrete with G. I. roof, Standard type A	21.0 ×36.1	3,283.21	19,497.60
	La Castellana	.do	Concrete with G. I. roof, Standard type A	21.0 ×36.1	3,283.2	25,801.51
	La Carlota	.do	Concrete with G. I. roof, Standard type B-2	30.0 ×43.5	6,324.07	39,600.79
	Kabankalan	.do	Concrete with G. I. roof Standard type A	21.0 ×36.1	3,283.2	24,203.63
Pampanga	Macabebe	.do	Concrete with G. I. roof, Standard type	12.0 ×25.5	1,672.95	8,993.07
Pangasinan	Urdaneta	.do	Concrete with G. I. roof, Urdaneta type	6.0 ×16.8	614.27	5,147.60
Rizal	San Juan del Monte	1 market	Concrete with G. I. roof, Standard	17.0 ×18.0	1,874.25	7,478.87
Sorsogon	Gubat	Market building	Concrete with G. I. roof	18.0 ×38.0	3,276.56	13,920.80
Tarlac	Tarlac	Slaughterhouse	....do	12.2 ×14.9	247.86	3,559.45
	Concepcion	Market building	....do	24.0 ×42.0	5,291.03	9,000.00
Tayabas	Tayabas	Market tiendas	Wood with G. I. roof, open type	5.0 ×12.5	173.19	3,699.00

TABLE XIII.—*Presidencia buildings*

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Albay	Calolbon	1	Wood with G. I. roof, (Muntinlupa, type)	7.20×14.20	850.8	₱ 8,029.72
Bohol	Jetafe	Municipal building	Wood with G. I. roof, San Jose type	17.10× 9.10	1,787.82	17,787.54
	Lila	1	Wood with G. I. roof, Clarin type	13.20× 8.20	1,114.98	7,320.85
Cagayan	Baggac	1	Concrete and wood with G. I. roof	10.20×14.20	1,344.89	5,305.93
	Ballesteros	1	Wood with G. I. roof, San Jose type	17.10× 9.10	1,452.72	19,030.26
Camarines Sur	Nabua	1	Concrete and wood with G. I. roof, Gumaca type	10.40×20.10	1,904.0	20,716.90
	Bato	1	Wood with G. I. roof, two-story building	8.30×13.30	933.8	12,617.86
Cebu	Poro	1	.....do	8.20×13.20	952.77	12,680.70
	Alcantara	1	Concrete and wood with G. I. roof, reconstruction	11.85×16.35	639.60	5,762.69
Iloilo	Cabatuan	1	Masonry concrete and wood, reconstruction	18.0 × 8.33	1,375.7	12,000.00
Ilocos Norte	Pinili	1	Wood with G. I. roof, Clarin type	8.70×13.20	820.66	10,410.44
Lanao	Mumungan	1 municipal building	Wood with G. I. roof	6.0 ×12.0 2.0 × 4.0	354.00	3,772.47
Marinduque	Mogpog	1	Wood with G. I. roof, San Jose type A	8.10×16.10 1st 9.10×12.10 2nd	1,478.0	17,576.99
Misamis	Clarin	1	Wood with G. I. roof, Clarin type (two-story)	17.20× 8.60	1,613.3	12,404.18
Pampanga	Mabalacat	1	Concrete and wood with G. I. roof, standard Plan 1-story	10.0 ×15.0	1,107.84	18,986.59
Pangasinan	Bani	1	Wood with G. I. roof Clarin type two-story building	7.10×12.10 8.20×23.20	1,267.44	12,652.71
	Villasis	1	Wood with G. I. roof, Clarin type two-story building	7.10×12.10 8.20×23.20	1,267.44	12.452.35
	San Fabian	1	Wood with G. I. roof, San Jose type	5.10×10.10 9.10×17.10	1,473.23	19,219.43
Sulu	Parang	1	Wood with G. I. roof	8.20× 9.20	754.40	3,167.06
	Bilaan	1	Concrete and wood with G. I roof	8.20× 9.20 2.70× 3.20	852	3,322.27
Tarlac	Victoria	1	Concrete and wood with G. I. roof, two-story building	12.80×24.0	3,132.33	35,688.64
Tayabas	Pagbilao	1	Concrete with G. I. roof, Carmen type	11.5 ×17.5	1,845.46	38,167.00
	Catanauan	1	Wood with G. I. roof, San Jose type (not painted)	8.10×16.10	1,259.76	11,625.38



New apron, Pier No. 3, Manila

TABLE XIV.—*Miscellaneous buildings*

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Baguio, City of	Baguio	1	Wood with G. I. roof, Social Hall, Teachers' Camp	22 ×56	9,300.00	₱66,481.24
		1	Wood with G. I. roof, Cottage 61	6 ×12	217.00	2,500.00
		1	Wood with G. I. roof, Cottage 62	7.7 × 7.7	206.00	2,500.00
		1	Wood with G. I. roof, Cottage 63	7.7 × 7.7	206.00	2,500.00
		1	Wood with G. I. roof, Cottage 64	7.7 × 7.7	217.00	2,500.00
		1	Wood with G. I. roof, Forestry building	8.0 ×12.0		3,807.84
		1	Wood with G. I. roof, Girls' Dormitory	13.0 ×35.0	3,952.00	7,077.00
	Trinidad	1	Wood with G. I. roof, Teachers' Cottage	7.0 × 9.0	220.00	2,000.00
Cavite	Cavite	1	Concrete and brick, Garbage Crematory	12.0 ×10.0		12,013.76
Davao	Davao	Magazine	Concrete with concrete slab roof	3.4 × 4.4	44.9	2,068.47
Ilocos Sur	Vigan	Magazine	Brick and rubble masonry with tile roof, for explosives	3.66× 2.99	52.47	1,243.28
Iloilo	Iloilo	Kitchen	Concrete and wood with G. I. roof, kitchen for Radio Station	3.0 × 4.0 2.0 × 4.0	33.9	1,000.00
Manila	Manila	1	Wood with G. I. roof, Bureau of Lands bodega	24.70×18.4	2,579.17	10,000.00
Pangasinan	Lingayen	Outhouse	Concrete and wood with G. I. roof, provided with flush closets and concrete septic tank	2–7.90×16.50	1,131.04	15,497.00
Tarlac	Tarlac	1	Concrete with G. I. roof, reconstruction of capital building	16.30×28.50	6,286.48	20,063.50

PORT WORKS CONSTRUCTION AND MAINTENANCE

Manila.—The casting of the concrete piles for the aprons around Pier No. 3 was started by administration on March 12, 1927, and contracts awarded to Mr. L. H. Thompson for the driving of the concrete piles and for the construction of the deck on March 30, 1927, and May 13, 1927, respectively. The aprons have a width of 7.75 meters and are identical in construction with those completed during 1926 at Pier No. 5. Unusually rapid progress was made on the project and the work was completed in October.

The construction of the Manila South Breakwater under contract with the Atlantic, Gulf and Pacific Company, progressed fairly satisfactorily throughout the year. A total of 108,030 metric tons of rock were delivered during the year. The contractors are at present experiencing some difficulty in obtaining suitable smooth-faced rock for the outer courses. They were granted an extension of time on this contract for the convenience of the Government, so that some badly needed work at Dalahican causeway could be done before the stormy season set in.

The maintenance work on Piers No. 7 and No. 5 consisted of minor repairs, due to damage done by shipping and stevedores and general painting and maintenance. Pier No. 3 was withdrawn from service while the construction of concrete aprons was under way. A total of ₱20,000 was expended for upkeep of Pier No. 3, ₱37,600 for Pier No. 5 and ₱15,600 for Pier No. 7. For the Pasig River Wall, upkeep work amounted to ₱6,900.

Considerable progress was made on estero dredging during the year. The dredging accomplished is shown in the accompanying tabulation. The curtailment of the appropriation prevented full-time operation of our equipment throughout the year, with consequent detriment to the general dredging requirements of Manila Harbor, the Pasig River and esteros.

Batangas causeway and boat landing, Batangas

On completion of the reclamation for the Manila Railroad Company near the Farola, Dredge No. 4 was assigned to work in Vitas Estero. Its work there was confined to dredging out the reach from the bar to the Tondo Development Company's bridge, the spoil being used to fill the said company's land at Isla de Balot.

The work accomplished on the more important port works projects in the provinces is as follows:

Butuan, Agusan.—Work on the construction of the Butuan Wharf was started by administration during June. The project comprises the construction of a reinforced concrete pile and girder wharf with timber deck, 9.5 meters in width and 22.7 meters in length. All the piles have been cast and suitable driving equipment and materials for the superstructure collected at the site. The project should be completed by the middle of the coming year.

San Jose, Antique.—The San Jose Wharf project includes the construction of 200 linear meters of rock causeway and the construction of a reinforced concrete pile wharf with wooden deck 22.7 meters long by 9.3 meters wide with an approach section 8.8 meters long by 5.1 meters wide. Proposals for the construction of the wharf were called for on June 30, 1927, but as no reasonable bids were received, it was necessary for the Government to undertake the work by administration. All the concrete piles have been cast and driving equipment is now being assembled at the site. Approximately 50 per cent of the rock for the causeway approach has been placed.

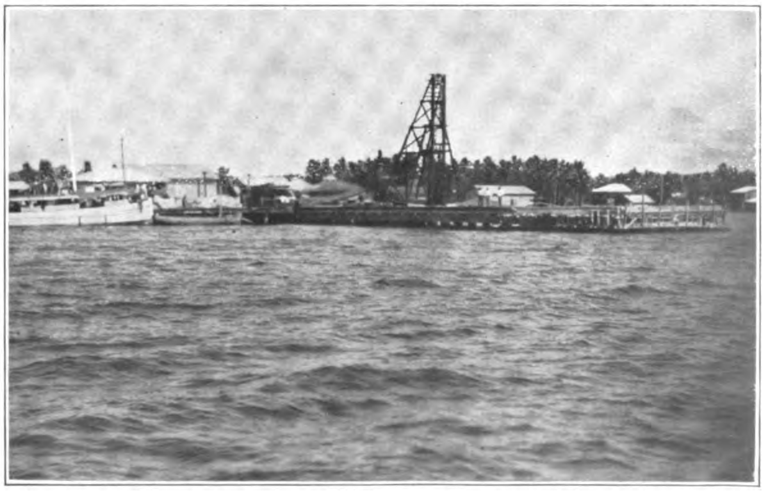
Batangas, Batangas.—An appropriation of ₱30,000 was expended during the year in completing a concrete landing stage for small boats at Batangas and in paving the causeway approach with asphaltum macadam. The landing as now completed will accommodate vessels of six-foot draft.

Tagbilaran, Bohol.—Piles were cast during 1926 for a 9.3 by 21.4-meter concrete pile and girder wharf with timber deck at Tagbilaran. The work of driving the piles was undertaken in April, 1927, by administration and progressed rather slowly due to the fact that the piles had to be spliced and redriven to obtain the required bearing. With the exception of the fender piles, the project was practically completed by the end of the year.

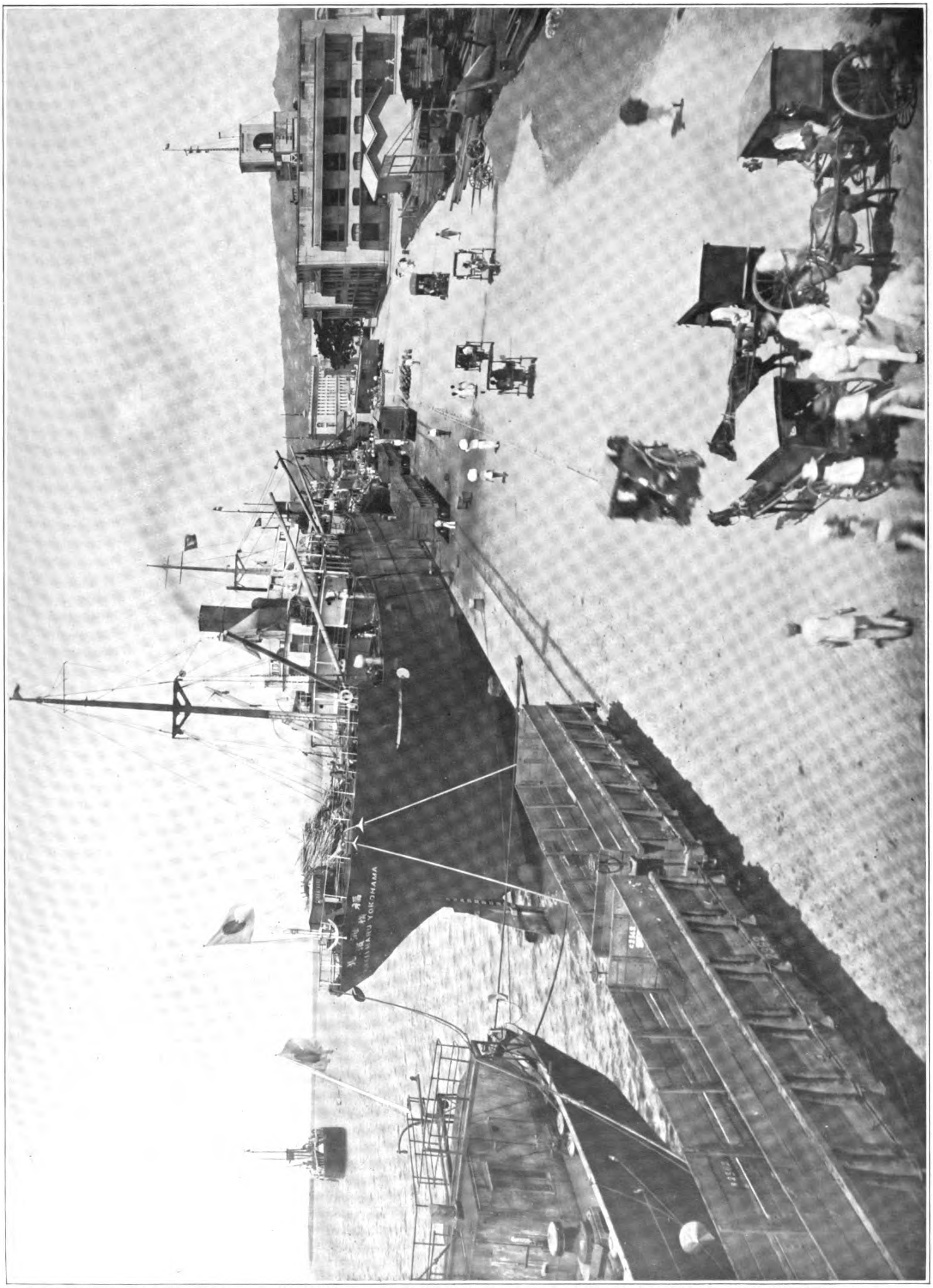
Loay, Bohol.—A contract covering the reconstruction of 70 linear meters of the Loay Jetties was awarded to Mr. Jesus Vaño on February 18, 1926. This work progressed so slowly that it became necessary for the Government to revoke the contract during the later part of 1927 and undertake the completion of the work by administration. At the end of the year the project was approximately 70 per cent completed.

Capiz, Capiz.—Work on the Capiz South Breakwater, which was started in 1926, was continued by administration until March 14, 1927, when a contract at the rate of ₱1.94 per metric ton of rock in place, was awarded to Mr. Gregorio Yotoko. At the end of the year 648 linear meters of breakwater were completed, at a total cost of approximately ₱71,000.

Cebu, Cebu.—Dredging along the Cebu water front was continued throughout the greater part of the year. A total of 20,000 cubic meters of material was dredged and deposited in the reclamation area.



Davao wharf, under construction, Davao Province



CEBU WATER FRONT, CEBU

Calumpang River revetment, Batangas

The jetty at the western end of Cebu Harbor, begun in 1925 under contract with Mr. R. R. Landon and later taken over by the Government, has been practically completed. Approximately 7,000 tons of derrick rock were placed during the year making a total of 14,300 tons of rock which has been utilized in the construction of the jetty. The jetty was designed primarily for the purpose of preventing sand drift in the harbor and thereby reducing the dredging operations formerly required. The jetty is proving very successful in this respect.

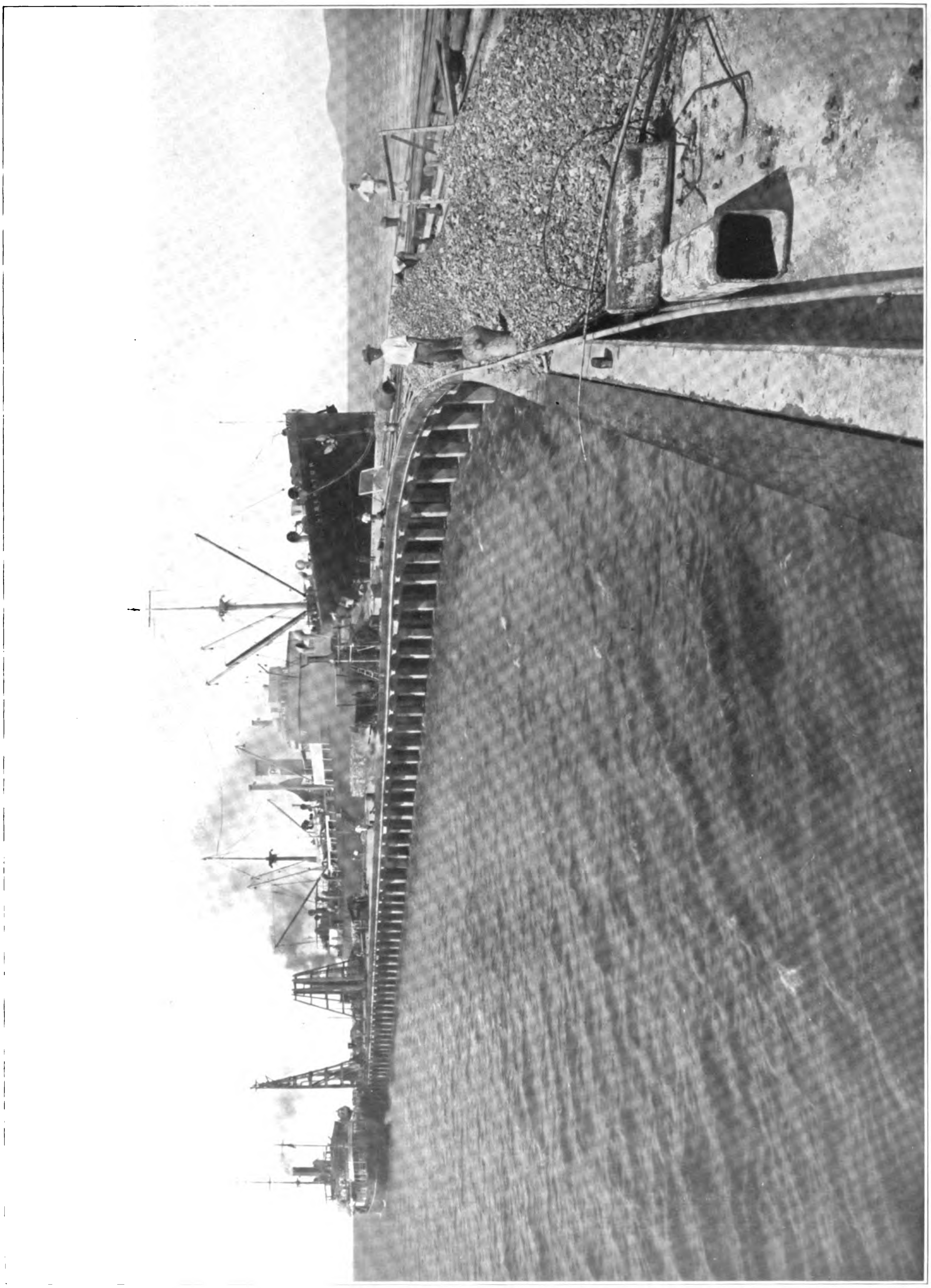
The contract for the construction of 230 linear meters of marginal concrete wharf in front of the Cebu Reclamation Area was awarded to the Atlantic, Gulf and Pacific Company on July 28, 1927. Exceptionally satisfactory progress has been made on this project and on December 31, 1927, a total of 162 concrete piles had been driven and 18 panels of the concrete deck cast. Funds are now available for the construction of the remaining 177 linear meters of wharf which will be undertaken as additional work under the same contract. The completion of this wharf will greatly relieve the present congestion of interisland shipping and with the sale of insular bonds in the amount of ₱4,000,000 authorized by the last Legislature, it will be possible to construct adequate additional deep water berths for overseas shipping and provide much needed cargo storage space.

Davao, Davao.—A contract was awarded in 1926 to Mr. C. V. Powers for the construction of 59.6 linear meters of concrete pier 9.3 meters wide as an extension to the present wooden wharf at Davao. The work on the project progressed very slowly throughout the year due to the fact that the concrete piles had to be spliced, in some cases twice, in order to obtain the required bearing. On December 31, 1927, the entire 69 piles had been driven, spliced and redriven to bearing and 14 linear meters of deck slab cast. It is proposed to start the replacement of the present wooden approach with a concrete structure from funds appropriated in the 1928 Budget.

Iloilo, Iloilo.—A contract was awarded to Mr. George G. Martin in 1926 for the construction of 115 linear meters of concrete river wall with timber pile foundation. Mr. Martin completed 33 linear meters of wall and on June 24, 1927, assigned his contract to Mr. J. W. Ford. At the end of the year a total length of 92 linear meters of wall had been completed. This project when completed will close the gap in the wall below the Iloilo Custom House and will provide additional docking space in the upper reach of the river for interisland vessels.

A contract was awarded in 1926 to Messrs. George G. Martin, William Werry and S. Conway for the delivery of 25,000 metric tons of derrick rock for the jetties at the mouth of the Iloilo River and 12,500 metric tons of derrick rock for the Iloilo Spur Dike. Work was actually begun on March 3, 1927, and has progressed very slowly due to the poor and inadequate equipment of the contractors. At the end of the year the contractors had delivered only approximately 11,000 tons of rock, or less than one-third of the quantity covered by their contract. However, the contractors are at present constructing new equipment and it is hoped the work will progress much more rapidly in the future. The purpose of the jetty at the mouth of the river is to prevent the formation of a bar at the river mouth and the purpose of the spur dike is to prevent further erosion of the shore line on the south side of the city. Although only a comparatively small quantity of rock has so far been delivered, beneficial results have in both instances been noted.

Pulupandan, Occidental Negros.—Work on the construction of the Pulupandan Pier has progressed very satisfactorily during the year. This work is being undertaken by the Atlantic, Gulf and Pacific Company, as assignee for the Maao Sugar Central Company, to whom a contract covering the development of the port was awarded on January 26, 1926. The project includes the construction of a reinforced concrete pier extension to the present wooden pier of the



PULUPANDAN CONCRETE PIER, UNDER CONSTRUCTION, OCCIDENTAL NEGROS

Maao Sugar Central Company, the construction of 300 linear square meters of creosoted timber sea wall and the reclamation of 10,000 square meters of foreshore land. The concrete pier extension consists of the approach section 7.90 meters in width and 67.70 meters long, the pier head varying in width from 7.90 meters to 21.75 meters and 45.20 meters long and the main pier 21.75 meters in width and 151.50 meters long. The pier is supported by 50-centimeter, reinforced concrete, piles. The entire concrete pier extension has been completed except for placing the asphaltic pavement and installing the fender piles. The 1928 Appropriation Act as passed by the last Legislature provides sufficient funds for replacing 108 linear meters of the present wooden approach with concrete construction. This work will be undertaken early in 1928.

Dumaguete, Oriental Negros.—A contract was awarded to Mr. C. V. Powers on November 8, 1927, for the construction of the Dumaguete Concrete Pier. The project consists of the construction of a reinforced pier 63 meters in length and 12.3 meters in width supported by 50-centimeter, reinforced concrete, piles. The work of casting the piles has already been started and it is expected that the pier will be completed by the end of 1928.

Zamboanga, Zamboanga.—An appropriation of only ₱40,000 was available for port improvements at Zamboanga during 1927. These funds were expended in repairs to the wooden wharf approach and in replacing the wooden piles with concrete piles on 45 linear meters of timber wharf. With the 1928 appropriation, it is proposed to start the construction of a concrete pile approach to replace the present timber structure.

Maintenance and minor port construction.—The maintenance of the existing port structures and minor port construction work were undertaken during the year at Tacloban, Province of Leyte; Cagayan, Province of Misamis; Larena, Province of Oriental Negros; Catbalogan, Province of Samar; Casiguran, Province of Sorsogon; Sorsogon, Province of Sorsogon; and Jolo, Province of Sulu.

Dredging operations, 1927

Location	(C. M.) Total 1902 to 1926	(C. M.) Total for 1927	Steamship Dredger	Dredges							Total
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	
											Cubic meters
Lower Pasig River	7,992,530	272,910	149,000	122,560					1,350		8,265,440
Outer Harbor	5,221,430	264,049	263,500					549			5,485,479
Upper Pasig River	1,030,486	7,129				4,321		1,208	1,540		1,037,615
Inner Basin	599,213	37,000	37,000								636,213
Binondo Estero	79,276										79,276
Estero de la Reyna	290,828	8,878						8,878			299,706
Paco Estero	45,189	10,731							10,731		55,920
San Miguel Estero	60,842										60,842
Provisor Estero	31,681	6,673							6,673		38,364
Marine R. Ry. Eng. Is	45,407										45,407
Talim Island (city)	1,071										1,071
Outer Bar	1,503,354	119,680	108,000	11,680							1,623,034
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580										16,580
Engineer Island Canal	37,540										37,540
Vitas Estero	540,365	208,871				17,257	185,647	5,967			749,236
Quiapo Estero	12,507										12,507
Segado Estero	35,509										35,509
Pandacan Estero	172										172
San Lazaro Estero	22,975										22,975
Corregidor H. (Q. M.)	63,746										63,746
Iloilo River	2,964,632										2,964,632
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	30,155										30,155
District of Cavite	20,876										20,876
Tondo Beach	102,393	26,791					26,791				129,184
Santibañez Estero	24,216										24,216
Tanque Estero	28,057										28,057
Tacloban Wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato river	49,462										49,462
Earnshaw's slipways	55,113										55,113
Los Baños Pier	11,160										11,160
U. S. Navy, Cavite	946,160	366,000	366,000								1,312,160
Concordia Estero	15,415										15,415
Malabon Canal	36,821										36,821
Port Libas, Capiz	31,413										31,413
Napindan Bar	100,856										100,856
Polo Club	12,471										12,471
Sunog Apug Estero		14,850				14,850					14,850
Bankusay Estero		3,390				3,390					3,390
Total	22,696,032	1,346,952	923,500	134,240		39,818	212,438	16,662	20,294		24,042,984

ARTESIAN WELLS

The Insular aid of ₱313,000 authorized for the drilling of artesian wells during the year 1927, enabled this Bureau to keep in the field an average of seventeen (17) drilling machines, out of the 30 that belong to the Insular Government. Sixteen of these machines were kept in constant operation thruout the year, as against 13 for the preceding year, when the appropriation was ₱210,000. There were 128 public wells completed in 1927, 124 of which were successful and 4 unsuccessful, as against 98 wells completed in 1926, 81 of which were successful while 17 were unsuccessful.

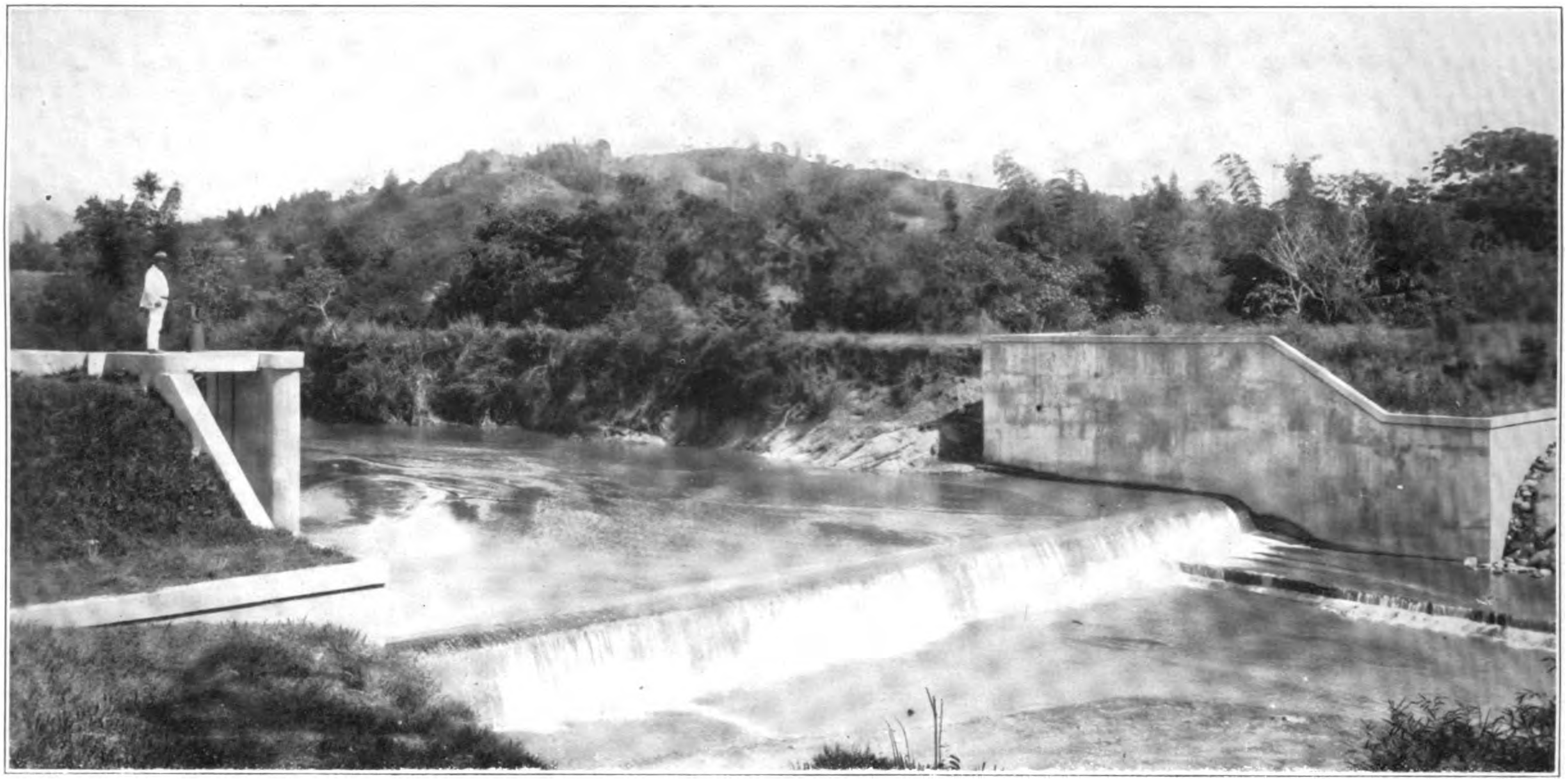
At the end of the year there were on file requests for the drilling of 213 artesian wells, from 107 municipalities, located in 25 different provinces.

The total number of successful artesian wells drilled by the Bureau of Public Works from 1904 to 1927 is 1,956. This number includes private wells drilled from 1904 to 1923. These wells are capable of supplying a total of 46,114,420 gallons of potable water per 12-hour day, which, at the rate of 20 gallons per capita, is sufficient to provide a water supply for 2,305,721 people.

Funds expended

	1926		1927	
		Per cent		*Per cent*
Successful wells	₱143,716.28	83	₱296,291.63	97
Unsuccessful wells	57,435.90	17	8,654.36	3
Total	201,152.18	100	304,945.99	100

From the artesian wells appropriation for the year 1927, the sum of ₱4,000 was allotted for making geological surveys and investigations by the Bureau of Science to determine the feasibility of drilling artesian wells in doubtful localities, and places where a large percentage of unsuccessful wells have been drilled. The places investigated were the vicinities of the towns of Passi and Calinog in



Diversion, Iloilo waterworks, Iloilo

Iloilo Province and Dumarao and Dumalag, Capiz Province, comprising an area of approximately 600 square kilometers of central Panay.

All of the 4 unsuccessful wells drilled during 1927 were abandoned due to the fact that no potable water was encountered at a reasonable depth. None were abandoned due to loss of drilling tools.

The small number of unsuccessful wells drilled during the year as compared with the preceding year is due mainly to the coöperation of the Bureau of Science and to closer supervision of the work made possible by the employment of three more supervising well drillers.

Drilling machines operated by B. P. W.

Type of machine	In field	Stored at the warehouses in Manila	Stored in the provinces	Total
Cyclone (belongs to the Province of Bulacan)	1	....	....	1
Keystone (operated by Los Baños Quarry)[1]	1	....	....	1
Star	1	3	....	4
Standard	....	1	....	1
Columbia No. 3	11	3	....	14
Columbia No. 5	4	1	2	7
Columbia No. 10	....	3	....	3
Total	18	11	2	31

[1] Not actually used in drilling artesian wells.

Comparative cost of drilling

	1926	1927	Increase (+) or decrease (−)
A. Unsuccessful wells included:			
Per meter	₱21.24	₱25.50	+ ₱4.57
Per foot	6.46	7.77	+ 1.31
B. Not including unsuccessful wells:			
Per meter	22.30	26.12	+ ₱3.82
Per foot	6.79	7.96	+ 1.17

The increase in the unit cost is due largely to the artesian wells drilled for waterworks purposes. These wells, in order to insure a continuous flow of water of greater volume than that required in ordinary wells drilled for public use, had to be drilled to a greater depth than is usually required. Also, to avoid as much as possible the plugging up of wells at the bottom from the inrush of sand caused by the heavy flow or heavy pumping, and to allow for the insertion of a larger working barrel for deep well pumps, these wells had to be completed with large-size drive pipe.

Summary of deep well drilling

	Number of wells drilled		Total depth		Total flow per minute	
	1926	1927	1926	1927	1926	1927
			Meters	*Meters*	*Liters per minute*	*Liters per minute*
Successful:						
Flowing	30	51	3,114	6,495	5,720	6,712
Pumping	51	73	3,332	4,849	3,729	8,036
Total successful	81	124	6,446	11,344	9,449	14,748
Unsuccessful	17	4	3,023	613	....	....
Grand total	98	128	9,469	11,957	9,449	14,749

At the end of the year there were 14 artesian wells under way drilled to an aggregate depth of 2,714 feet at a cost of ₱6,908.35.

There were three Insular artesian wells completed during the year, one each for the Deaf and Blind School at Pasay, Rizal, Insular Asylum at San Felipe Neri, Rizal, and the Benguet Auto Line near the Manila Railroad Company's Station at Damortis, Santo Tomas, La Union. The total cost of the well drilled for the asylum was charged against artesian well funds.

Bureau of Public Works machine shop

	1926	1927	Increase (+) or decrease (−)
Work orders	954	779	− 175
Cost of operation:			
Material	₱50,978.87	₱56,393.25	+ 5,414.38
Labor	87,291.44	54,096.58	−33,194.86
Total	138,270.31	110,489.83	−27,780.48
Average monthly work	₱11,522.53	₱9,207.49	− 2,315.04
Personnel	89	78	− 11
Overtime work days	122	77	− 45

Reservoir, Iloilo waterworks, Iloilo

The decrease in the amount of work orders performed during 1927 was due to the completion of Pier No. 7 from which a great portion of the work of the shop came in 1926. In view of the diminution of work, the personnel was also reduced to minimize the cost of labor.

DESIGNING DIVISION

J. C. Cookingham, *Acting Chief Designing Engineer*

The financing of numerous public works projects with insular loan and bond issue funds has caused an unusually active year for the Designing Division. The absence of the Chief Designing Engineer and one of the mechanical-electrical engineers in the United States during a part of the year and the continued shortage of experienced and trained designing engineers were serious handicaps to the division. Nevertheless, a large number of plans and specifications were completed and preliminary investigations and estimates made for the numerous projects to be undertaken during the coming year.

The usual testing of concrete materials for all Government projects has been continued throughout the year and strict compliance with specifications in the matter of maintaining the specified compressive strength for concrete has been insisted upon. As a result, the quality of concrete entering all structures built for the Government has been maintained at a very high average. A very large increase occurred in the number of concrete tests made during the year as well as increases in cement and gravel tests, which are shown in the following table:

	1926	1927	Increase
			Per cent
Total tests on cement ($\frac{1}{10}$ barrels tested)	6,880	8,790	28
Total tests on concrete	3,766	8,190	117
Total tests on sand	66	60	....
Total tests on gravel	34	42	23

Investigation of 894 foreshore lease and land sales applications were made for the Bureau of Lands, an increase of 30 per cent over the number made during the year 1926.

Plans, specifications, and estimates for projects covering bridges, port works, wiring of public buildings for electric lighting, pumping and power plants and other structures, as well as the more important activities of this division in the field, covering investigations, inspections, surveys, operation of cement gun, sand blast and calyx core drill outfits, installations and construction are listed in Tables A, B, C, D, E, F, G, H, I, and J. Numerous and varied miscellaneous time-consuming studies, technical consultations, preparation and correction of civil service examinations for civil, electrical and mechanical engineers and miscellaneous investigations and reports, in addition to those listed in the tables, were made by the personnel of the various sections of this division throughout the year.

An extensive and detailed evaluation of the Culion Ice, Fish and Electric Company's plant and an investigation of the operations of the company were made by the Supervising Mechanical and Electrical Engineer at the request of His Excellency, the Governor-General. As a result, a final agreement was reached covering the conditions and rates under which this company is to supply lighting, refrigeration, and fish to the Culion Leper Colony.

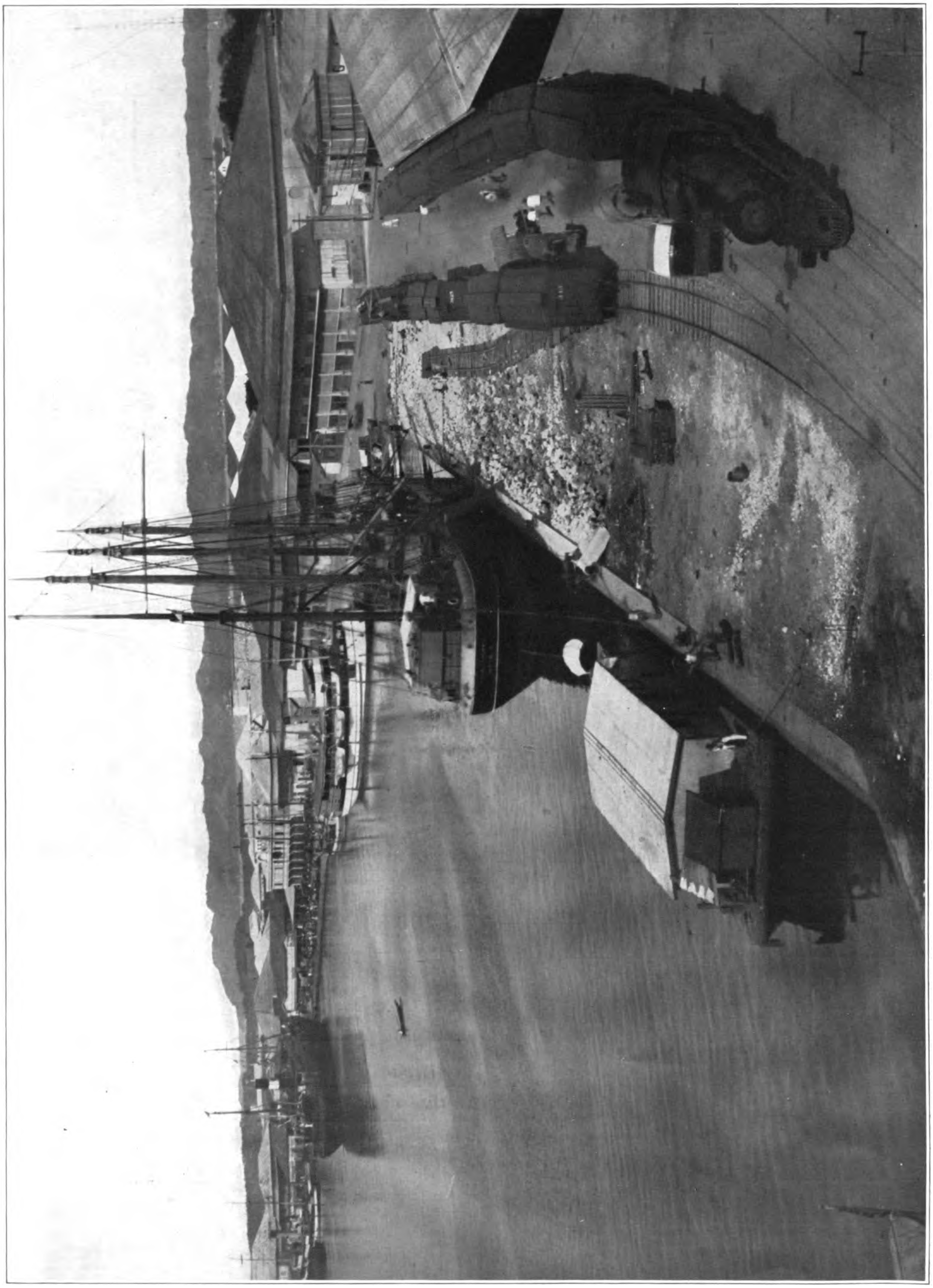
Five field outfits of calyx core drills with trained men in charge continued to be operated on the investigation of subsoil conditions for bridges, wharves, and other projects throughout the Islands. A total of 32 subsoil investigations were completed and boring samples submitted to the Manila Office for study. Two sand blast and cement gun outfits with experienced operators were utilized throughout the year on various repair and maintenance projects.

Engineering services were rendered during the year in the preparation of estimates, plans, specifications and advertisements, and in inspecting, testing and in some cases supervising the installation of electrical work in 39 building projects, 18 oil engine electric projects, 4 hydro-electric projects, 19 pumping plant projects, and 13 special mechanical and electrical projects.

A considerable improvement was effected in the water supply for the Culion Leper Colony. The supply has been so restricted in past dry seasons as to cause actual suffering. Groups of additional springs were located and developed, a new pumping unit installed and the storage and distribution system improved.

TABLE A.—*Bridges*

Province	River	Road	Type	Remarks
Batangas	Lagnas	Batangas–Bauan	R. C. Arch, 22.0 m.	Plans and specifications.
Do	Hagonoy	do	R. C. Arch, 15.0 m.	Do.
Bohol	Inabanga	Tagbilaran–North	Steel truss, 99.3 m.	Preliminary plan and estimate.
Bulacan	Pinagkabalian	Polo–Malabon	Suspension, 45.7 m.	Do.
Do	Cafehan	Manila–North	R. C. girder, 11.0 m.	Plans and specifications.
Do	Meycauayan	do	Steel truss, 74.7 m.	Do.
Do	Bocaue	do	Sidewalk added, 85.3 m.	Do.
Do	Marilao	do	Sidewalk added, 76.0 m.	Do.
Camarines Norte	Daet (McKinley)	Basud–Mercedes.	Steel truss, 49.7 m.	Preliminary plan and estimate.
Cavite	Malabon	Zapote–Cavite	Steel truss, 25.0 m.	Plans and specifications.
Do	Imus	Binakayan–Kawit	R. C. girder, 60.0 m.	Do.
Do	Malabon	General Trias–Pasong Camachile.	Steel truss, 16.7 m.	Do.
Cebu	Dayhagon Channel	Cebu–North	Draw bridge, 36.0 m.	Preliminary plan and estimate.
Davao	Davao	Davao–South	Steel truss, 139.8 m.	Plans and specifications.
Ilocos Sur	Dawara	Tagudin–Cervantes.	Steel truss, 49.7 m.	Preliminary plan and estimate.
Iloilo	Lamonan	Passi–Calinog	R. C. girders, 45.0 m.	Do.
Laguna	Magampon	San Pablo–Alaminos.	R. C. Arch, 22.0 m.	Plans and specifications.
Do	Malaunod	Manila–South	R. C. Arch, 11.0 m.	Do.
La Union	Naguilian	Bauang–Naguilian.	Steel truss and tre. approach 188.5 m.	Do.
Do	Borobor	Balaoan–Bangar.	R. C. girder, 35.0 m.	Do.
Do	Pantar–Sur	Bacnotan–North Bdry.	R. C. girder, 12.0 m.	Do.
Do	Darigayos	Bacnotan–Luna	R. C. girder, 60.0 m.	Preliminary plan and estimate.
Marinduque	Mogpog	Mogpog–Balanacan.	R. C. girder, 36.0 m.	Do.
Mindoro	San Vicente	Calapan	Sidewalk added 25.0 m.	Plans and specifications.
Misamis	Oroquieta	Misamis–North	Steel truss, 74.7 m.	Preliminary plan and estimate.
Do	Cagayan	Cagayan–West	Steel truss, 198.5 m.	Do.
Do	Talisayan	Cagayan–East	R. C. girder, 27 m.	Do.
Nueva Ecija	Pampanga	Manila–North	Steel truss, 605.4 m.	Plan and specifications.
Do	Binituan	do	Steel truss, 49.7 m.	Do.
Occidental Negros	Danao	Bacolod–North	R. C. girder, 51.0 m.	Do.
Do	Binalbagan	Hinigaran–Isabela.	Steel superstructure, 74.7 m.	Do.
Do	Suay	Bacolod–South	Steel truss, 46.7 m.	Do.
Do	Calatrava	Escalante–San Carlos.	R. C. girder, 72.0 m.	Plans.
Pangasinan	San Vicente	Binmaley–Capitol.	R. C. girder, 11.0 m. double	Plans and specifications.
Do	Inmanduyan	Manila–North	Steel truss, 49.7 m.	Do.
Rizal	Ibayo	Municipal	Timber superstructure on concrete pile 69.2 m.	Do.
Tarlac	Parua	Bamban–Mabalacat.	Steel truss, 121.1 m.	Do.
Do	Cut-cut	Capas–Bamban	Steel truss, 49.7 m.	Do.
Do	San Isidro	Panique–Moncada.	R. C. girder, 45.0 m.	Do.
Tayabas	Malaking-Ilog	Bolbok–Candelaria.	Steel truss, 62.3 m.	Do.
Zambales	Cabangan	Iba–South	Steel truss, 74.7 m.	Do.
Do	Bancal	Iba–Botolan	Steel truss, 148.9 m.	Preliminary plan and estimate.
Do	Salaza	Iba–North	Steel truss, 49.7 m.	Do.
Standard plans			Bamboo pontons	Plans.
Do			Steel pontoons	Do.
Do			R. C. girder, 10.0 m.	Do.
Do			R. C. girder, 7 m.	Revised as to roadway.
Do			R. C. girder, 8 m.	Do.
Do			R. C. girder, 9 m.	Do.
Do			R. C. girder, 10 m.	Do.
Do			R. C. girder, 11 m.	Do.
Do			R. C. girder, 12 m.	Do.
Standard plans			R. C. culvert, 1.0×0.5, single.	Revised as to roadway.
Do			R. C. culvert, 1.0×1.0, single.	Do.
Do			R. C. culvert, 1.0×1.5, single.	Do.
Do			R. C. culvert, 1.5×1.0, single.	Do.
Do			R. C. culvert, 1.5×1.5, single.	Do.
Do			R. C. culvert, 1.5×2.0, single.	Do.
Do			R. C. culvert, 2.0×1.0, single.	Do.
Do			R. C. culvert, 2.0×1.5, single.	Do.
Do			R. D. culvert, 2.0×2.0, single.	Do.
Do			R. C. culvert, 2.5×1.0, single.	Do.
Do			R. C. culvert, 2.5×1.5, single.	Do.
Do			R. C. culvert 2.5×2.0, single	Do.
Do			R. C. culvert 2.5×2.5, single	Do.
Do			R. C. culvert 3.0×1.0, single	Do.
Do			R. C. culvert, 3.0×1.5, single.	Do.
Do			R. C. culvert, 3.0×2.0, single.	Do.
Do			R. C. culvert, 8.0×2.5, single.	Do.
Do			R. C. culvert, 3.0×3.0, single.	Do.
Do			R. C. culvert, 3.5×1.0, single.	Do.
Do			R. C. culvert, 3.5×1.5, single.	Do.
Do			R. C. culvert, 3.5×2.0, single.	Do.
Do			R. C. culvert, 3.5×2.5, single.	Do.
Do			R. C. culvert, 3.5×3.0, single.	Do.
Do			R. C. culvert, 3.5×3.5, single.	Do.
Do			R. C. culvert. 4.0×1.0, single,	Do.
Do			R. C. culvert, 4.0×1.5, single.	Do.
Do			R. C. culvert, 4.0×2.0, single.	Do.
Do			R. C. culvert, 4.0×2.5, single.	Do.
Do			R. C. culvert, 4.0×3.0, single.	Do.
Do			R. C. culvert, 4.0×3.5, single.	Do.
Do			R. C. culvert, 4.5×1.5, single.	Do.
Do			R. C. culvert, 4.5×2.0, single.	Do.
Do			R. C. culvert, 4.5×2.5, single.	Do.
Do			R. C. culvert, 4.5×3.0, single.	Do.
Do			R. C. culvert, 4.5×3.5, single.	Do.
Do			R. C. culvert, 4.5×4.0, single.	Do.
Do			R. C. culvert, 5.0×2.0, single.	Do.
Do			R. C. culvert, 5.0×2.5, single.	Do.
Do			R. C. culvert, 5.0×3.0, single.	Do.
Do			R. C. culvert, 5.0×3.5, single.	Do.
Do			R. C. culvert, 5.0×4.0, single.	Do.
Do			R. C. culvert, 5.0×4.5, single.	Do.
Do			R. C. culvert, 1.5×1.0, single.	Do.
Do			R. C. culvert, 2.0×1.0, single.	Do.
Do			R. C. culvert, 2.5×1.0, single.	Do.
Do			R. C. culvert, 2.5×1.5, single.	Do.
Do			R. C. culvert, 3.5×2.0, single.	Do.
Do			R. C. culvert, 3.5×2.5, single.	Do.
Do			R. C. culvert, 3.5×3.0, single.	Do.
Do			R. C. culvert, 3.5×3.5, single.	Do.
Do			R. C. culvert, 4.0×2.0, single.	Do.
Do			R. C. culvert, 4.0×2.2, single.	Do.
Do			R. C. culvert, 4.0×2.5, single.	Do.
Do			R. C. culvert, 4.0×3.0, single.	Do.



ILOILO WATER FRONT SHOWING WHARF EXTENSION, ILOILO

TABLE A.—*Bridges*—Continued

Province	River	Road	Type	Remarks
Standard plans			R. C. culvert, 4.0×4.0, single.	Revised as to roadway.
Do.			R. C. culvert, 4.5×2.0, single.	Do.
Do.			R. C. culvert, 4.5×2.5, single.	Do.
Do.			R. C. culvert, 4.5×3.0, single.	Do.
Do.			R. C. culvert, 5.0×2.5, single.	Do.
Do.			R. C. culvert, 5.0×3.5, single.	Do.
Do.			R. C. culvert, 5.0×4.0, single.	Do.
Do.			R. C. culvert, 5.0×4.5, single.	Do.

TABLE B.—*Portworks*

Province	Port	Type of structure	Remarks
Agusan	Butuan	B. C. pile wharf	Construction.
Albay	Legaspi	R. C. wharf	Plans.
Antique	San Jose	R. C. pile wharf	Construction.
Batangas	Batangas	Concrete landing	Construction completed.
Bohol	Tagbilaran	R. C. pile wharf	Construction.
Bohol	Loay	Rock jetty	Do.
Cagayan	Aparri	Rock jetty	Plans and specifications.
Capiz	Capiz	Rock breakwater	Construction.
Cavite	Dalahican	Rock breakwater	Construction completed. under contract.
Cebu	Cebu	Rock jetty	Construction.
Cebu	Cebu	Reclamation	Dredging.
Cebu	Cebu	R. C. wharf	Contract and construction.
Davao	Daval (Santa Ana)	R. C. wharf	Construction under contract.
Iloilo	Iloilo River	Rock jetties	Do.
Iloilo	Iloilo River	Concrete wall	Do.
Leyte	Tacloban	R. C. wharf	Plans and specifications.
Manila	Manila Pier No. 3	R. C. aprons	Construction completed under contract.
Manila	Manila Harbor	Rock breakwater	Construction under contract.
Manila	Pasig River	Jetty	Plans and specifications.
Manila	Pasig River	Combination highway and railway breakwater.	Plans.
Misamis	Cagayan	R. C. wharf	Maintenance.
Occidental Negros	Pulupandan	Port development and pier.	Construction under contract.
Oriental Negros	Dumaguete	R. C. pier	Plans, specification, and contract.
Oriental Negros	Lazi	Rock causeway	Construction under contract.
Samar	Catbalogan	Break causeway and breakwater.	Construction.
Sorsogon	Sorsogon	Rock seawall	Do.
Sorsogon	Casiguran	Rock causeway	Construction under contract.
Sulu	Jolo	Concrete retaining wall.	Plans and specifications.
Zamboanga	Zamboanga	R. C. wharf extension.	Construction and maintenance.

TABLE C.—*Wiring of buildings*

Province	Location	Type	Remarks
Batangas	Batangas	Capitol building (right and left wings)	Plans and contract.
Do	do	Provincial hospital	Completed by contract.
Do	Bolbok	Presidencia	Plans.
Cebu	Cebu	Wharf	Plans and specifications.
Davao	Davao	do	Do.
Laguna	Santa Cruz	Provincial Court House.	Plans.
Do	San Pablo	Cemetery Chapel	Plans.
Manila	Manila	Addition to Normal Hall.	Finished by contract.
Do	do	Medical School Annex.	Plans and estimates advertised by U. P.
Do	do	Contagious pavilion Philippine General Hospital.	Plans and contract.
Do	do	Contagious pavilion, San Lazaro Hospital.	Do.
Do	do	P. N. S. Addition	Finished by contract.
Do	do	Negative Leper Building San Lazaro Hospital.	Plans and contract.
Do	do	Post Office Building	Plans.
Do	do	Post Office Garage	Do.
Do	do	Post Office machinery shop.	Do.
Marinduque	Boac	Capitol Building	Plans and installation.
Mountain Province	Baguio	Social Building Teacher's Camp.	Plans and contract.
Nueva Ecija	Muñoz Agricultural School.	Mess Hall	Finished by administration.
Do	do	Dormitory Building	Do.
Do	Cabanatuan	Provincial High School Call Bell	Do.
Occidental Negros	Bacolod	Capitol Building	Plans and contract.
Do	Murcia	Mambucal Spring Bath.	Plans.
Do	Bacolod	Provincial High School.	Do.
Do	Pulupandan	Pier	Plans and specifications.
Oriental Negros	Dumaguete	Concrete pier	Do.
Pampanga	Mabalacat	20-room school building.	Do.
Do	San Fernando	Park lighting	Plans and bill of materials.
Pangasinan	Bayambang	Normal School call bell system.	Plans and contract.
Do	Lingayen	H. S. Auditorium	Preliminary estimate.
Do	do	Bridge No. 256.09	Plans and contract.
Rizal	San Felipe Neri	Insular Asylum, male ward.	Do.
Do	do	Insular Asylum female ward.	Do.
Do	do	Insular Asylum, administration building.	Plans.
Do	do	Insular Asylum, kitchen building.	Do.
Tarlac	Manila-Tarlac Road	Bridge No. 72.19	Plans and specifications
Tayabas	Lucena	Provincial grounds	Finished by administration.

TABLE D.—*Oil engine driven electric systems*

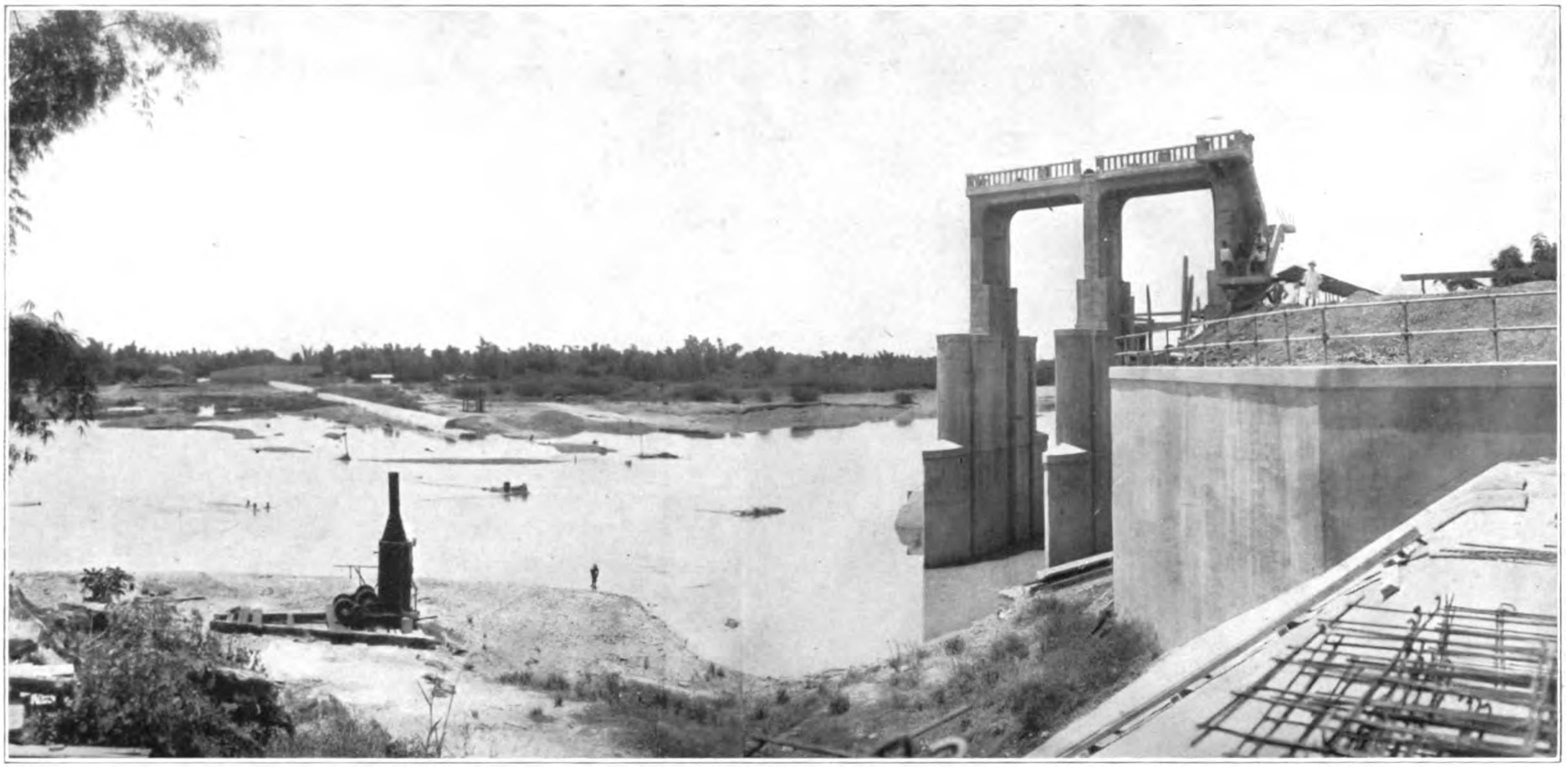
Province	Location	Type	Remarks
Albay	Albay	Hospital lighting	Finished by administration.
Batangas	Batangas	Capitol and hospital lighting.	Do.
Do	do	Municipal electric 3rd general unit.	Specifications and selection.
Do	Bauan	Light and power	Plans and contract.
Bulacan	Hagonoy	Lighting	Estimate and comments.
Camarines Sur	Magarao	do	Do.
Cebu	Argao	do	Finished by contract.
Do	Carcar	do	Comments on proposal to take over private plant.
Laguna	Santa Cruz	Hospital lighting	Preliminary plans and bill of machinery.
Occidental Negros	Bacolod	do	Estimate and comments.
Do	San Carlos	Lighting	Comments on plans of franchise holder.
Pangasinan	Lingayen	General plant extension.	Contract and tests.
Do	Binmaley	Lighting	Plans and bill of materials.
Do	Calasiao	do	Estimate and comments.
Do	Dagupan	Hospital lighting	Repairs and adjustments.
Samar	Catbalogan	Lighting	Comments on proposed improvements.
Tayabas	Mauban	Street lighting	Plans and specifications.
Do	Gumaca	Lighting	Project disapproved.

TABLE E.—*Hydroelectric plants*

Province	Location	Type	Remarks
Laguna	Los Baños	Power for quarry	Finished by administration.
Do	Nagcarlan	Power development	Complete report submitted.
Mountain Province	Bontoc	do	Do.
Zamboanga	Zamboanga	Plant extension	Plans and specifications.

TABLE F.—*Pumping plants*

Province	Location	Type	Remarks
Batangas	Batangas	Deep well and hot water.	Installed by administration.
Do	Taal	Balisong pump	Inspection and repairs.
Cavite	Indang	Waterworks pump	Do.
Cotabato	Cotabato	Water supply	Preliminary study.
Ilocos Norte	Badoc	Waterworks	Plans specification and selection of equipment.
Laguna	Pagsanjan	Waterworks second pump.	Plans and specifications.
Mindoro	Calapan	Waterworks	Engine selected from bids.
Mountain Province	Baguio	Pneumatic pump sets	Selection and recommendation.



Peñaranda River diversion works, under construction (view taken from the headworks side of the river)

TABLE F.—*Pumping plants*—Continued

Province	Location	Type	Remarks
Manila	Manila	Santol T. C. Pump, New Set.	Installed by contract.
Do	do	S. L. Hospital deep well pump.	Do.
Do	do	Insular Legislative Building.	Automatic air control installed by administration.
Do	do	P. C. Building pneumatic pump.	Preliminary study.
Pangasinan	Lingayen	Second pump waterworks.	Installed by administration.
Do	Dagupan	Hospital water supply spare pump.	Installation and repairs.
Palawan	Culion Leper Colony	Waterworks	Improved in general; data for future expansion obtained repairs done.
Rizal	Pasay	Deaf and Blind school deep well pump.	Installed by administration.
Do	Welfareville	Deep well pump	Repairs.
Do	San Felipe Neri	Asylum deep well pump.	Specification and selection.
Tarlac	Tarlac	Provincial water supply.	Plans of improvement: bill of materials.

TABLE G.—*Calyx core drilling*

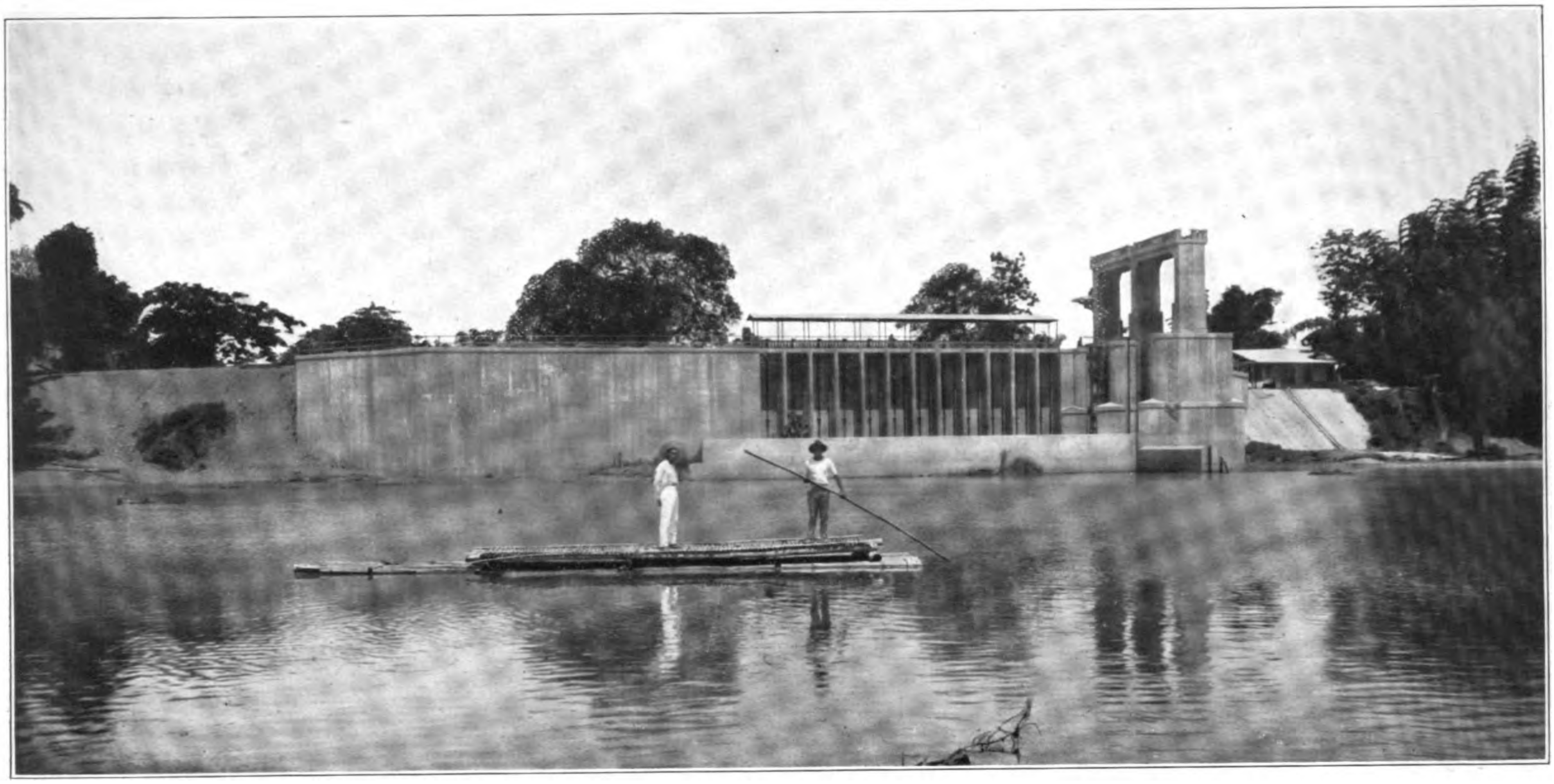
Province	Location	Type	Remarks
Bohol	Inabanga River	Bridge	Borings completed.
Do	Tagbilaran	Wharf	Do.
Bulacan	Cafehan Creek	Bridge	Do.
Capiz	Mambusao River	do	Do.
Do	Libas	Wharf	Do.
Camarines Norte	Linawan River	Bridge	Do.
Do	Daet River	do	Do.
Cebu	Bangon River	do	Do.
Do	Cebu	Wharf	Do.
Laguna	San Cristobal River	Bridge	Do.
Do	Malaunod River	do	Do.
La Union	Maragayap River (east).	do	Do.
Do	Maragayap River (west).	do	Do.
Do	Bauan River	R. R. Bridge	Do.
Do	Naguilian River	Bridge	Do.
Do	Darigayos River	do	Do.
Marinduque	Mogpog River	do	Do.
Misamis	Oroquieta River	do	Do.
Do	Cagayan River	do	Do.
Do	Talisayan River	do	Do.
Occidental Negros	Calatrava River	do	Do.
Occidental Negros	Suay River	do	Do.
Occidental Negros	Pulupandan	Pier	Do.
Pangasinan	Inmanduyan River	Bridge	Do.
Do	San Vicente Creek	do	Do.
Tayabas	Malaking-Ilog River	Bridge	Borings completed.
Tarlac	San Isidro River	do	Do.
Zambales	Salaza River	do	Do.
Do	Bancal River	do	Do.
Do	Cabangan River	do	Do.
Do	Zamboanga	Wharf	Do.
Do	Tumanga River	Bridge	Do.

TABLE H.—*Cement gun and sand blasting*

Province	Location	Type	Remarks
Cebu	Various jobs	Repairs	Cement gun.
Leyte	Various bridges	Repairs, cleaning, and painting.	Cement gun and sand blasting.
Manila	Pier No. 3	Construction	Cement gun.
Do	Pier No. 7	Repairs	Do.
Do		Repairs and overhauling.	Cement gun and compressors.
Occidental Negros	Pulupandan pier	Construction	Cement gun.
Tayabas	Gumaca River Bridge	Repairs	Do.

TABLE I.—*Mechanical-electrical*

Province	Location	Type	Remarks
Batangas	Batangas	Capitol and hospital plant booster set.	Specification and selection.
Do	do	Capitol and hospital fire protection.	Plans and bill of materials.
Davao	Santa Ana District	Fire fighting apparatus.	Recommendations.
Ilocos Sur	Abra Ferry	Power unit	Specification and selection.
La Union	San Fernando	Ornamental lamp posts.	Design and estimate.
Laguna	Los Baños Quarry	New crusher	Installation.
Misamis	Cagayan	Pump engine	Repairs.
Manila	Manila	Insular Legislative Building elevator.	Specification and contract.
Do	Bureau of Agriculture	Veterinary research laboratory portable operating table.	Plans and bill of materials.
Nueva Ecija	Muñoz	Extension of W. W. piping and electric wiring.	Do.
Pangasinan	Lingayen	Electric plant engine.	Contract and tests.
Rizal	San Felipe Neri	Asylum refrigerating plant.	Plans and specifications.



Headworks, Peñaranda River Irrigation System (view taken from the river)

TABLE J.—*Investigations and reports*

Province	Location	Type	Remarks
Bataan	Orion	Orion arson case	Investigation and testimony.
Cavite	Indang	Proposed electric plant.	Investigation and recommendations.
Ilocos Norte	Abra Gap	Power ferry	Inspection and recommendation.
Do	Gaan Bay	Port development	Investigation, survey, and report.
Ilocos Sur	Pandan	do	Do.
Do	Salomague	do	Do.
Do	San Ildefonso	do	Do.
Laguna	Nagcarlang	Electric power development.	Investigation and report.
Manila	Manila	Oil engine road roller.	Investigation and study.
Do	do	Auto standardization.	Test and study.
Palawan	Culion	Waterworks	Study, investigation, and report.
Do	do	Culion, ice, fish, and electric plant.	Evaluation and report.

DIVISION OF ARCHITECTURE

CHERI MANDELBAUM, *Acting Chief of Division*

The activities of the division during 1927 were confined largely to the preparation of plans and specifications for provincial and municipal projects. This was due to the limited appropriations provided for Insular projects. The revision of the final plans of the Manila Post-Office Building was made and an Insular appropriation of ₱2,500,000 authorized for completing construction work. Plans prepared for other important projects include the proposed Library Building of the University of the Philippines, Insular Asylum Building and Capitol buildings for the provinces of Cebu and Occidental Negros. Studies were made and drawings prepared for numerous other projects, the status of which are given in the following tabulation of projects assigned to supervising architects:

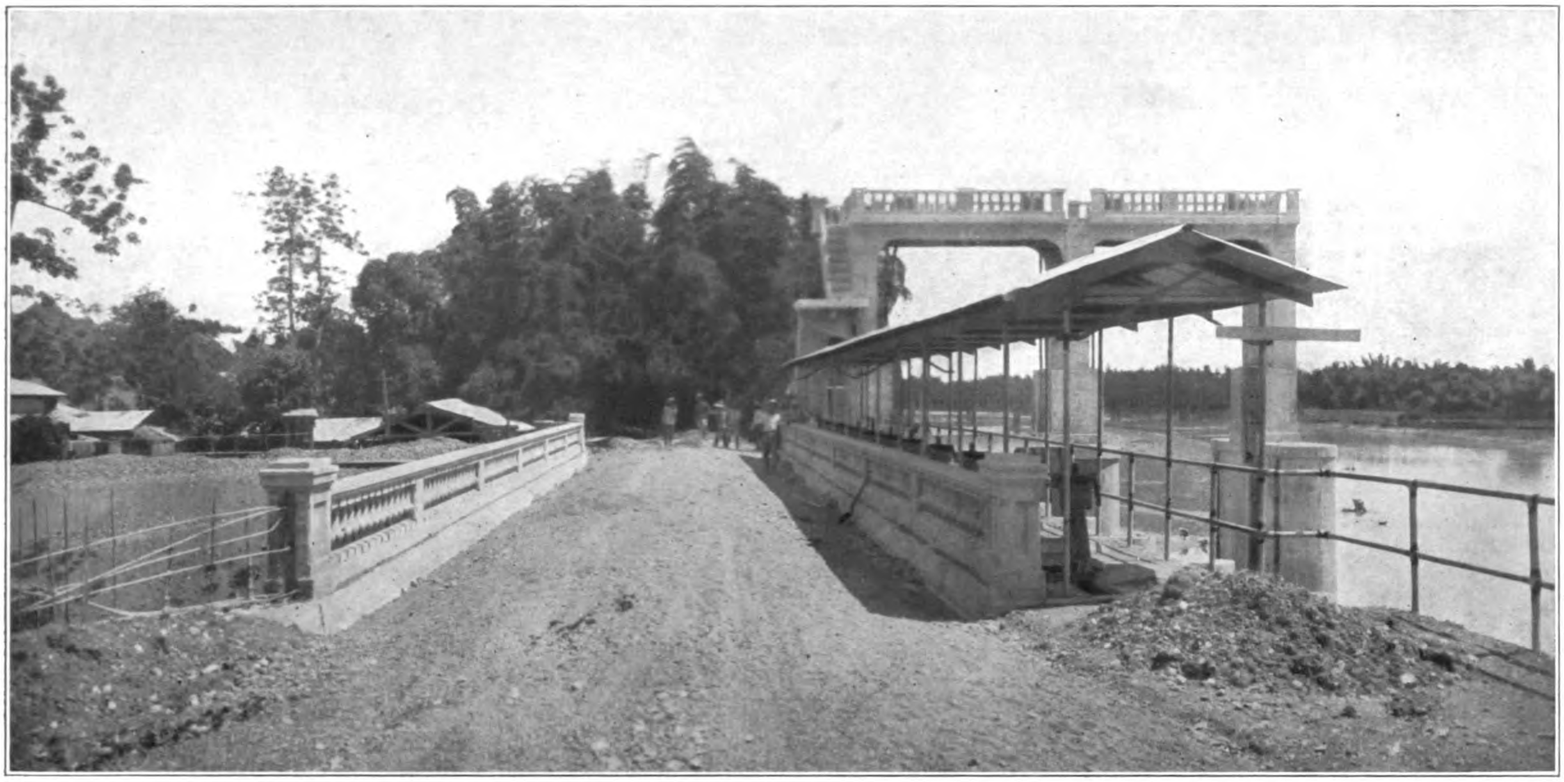
Projects assigned to Mr. Tomas Mapua, supervising architect

Manila projects	Status
1. Training School Building, Normal School	Full size details prepared.
2. Contagious Pavilion, Philippine General Hospital	Preliminary plans and working drawings completed.
3. Normal Hall Addition	Working drawings completed, design of iron grille fence completed.
4. Contagious Pavilion, San Lazaro Hospital	Preliminary plans and working drawings completed.
5. Crematory, San Lazaro Hospital	Study.

Provincial projects	Status
1. Administration Building, Insular Asylum	Bids opened December 28, 1927.
2. Kitchen Building, Insular Asylum	Do.
3. Pangasinan High School Auditorium	Architectural drawings nearing completion. Structural drawings under preparation.
4. Laguna court house	Architectural drawings completed. Structural drawings nearing completion.
5. Capitol building, Cebu	Preliminary drawings completed.
6. Antique Hospital	Eighty-five per cent completed.
7. Vault, Ilocos Norte, Laoag	Completed.
8. San Pedro Macati Memorial Building, Rizal	Eighty per cent completed.
9. West Annex, Laoag Capitol, Ilocos Norte	Architectural plans completed.
10. Vault, Davao provincial building	Completed.
11. Vault, Ilagan, Isabela	Eighty per cent completed.
12. Hospital, Dapitan, Zamboanga	Standard plan selected.
13. Lilio municipal building, Laguna	Eighty per cent completed.
14. Hospital grounds, Albay	Completed.
15. Name plate, Marinduque Capitol	Do.
16. Bukidnon Hospital	Architectural plans completed.
17. Davao private patients pavilion, Davao Hospital	Seventy per cent completed.

Awaiting preparation

1. Provincial park and bath house, Naga, Tiwi, Albay.	Funds not available.
2. Mainit Bath House, Tayabas	Do.
3. Cebu Post Office	Do.
4. Rizal monument, Paniqui, Tarlac	No action taken.
5. Development plan, provincial ground, Romblon	No action.
6. Tarlac provincial grounds	Confer with district engineer.
7. Working men's chalets, Laguna	No action taken.
8. Improvement, hospital ground, Laguna	Do.
9. Cemetery, Biñan, Laguna	Confer with municipal president.
10. Fountain, Davao Public Hospital	No action taken.
11. Rizal and Bonifacio monument, Legaspi, Albay	Do.
12. Colors for standard schools	Completed.
13. Swimming Tank, Cabanatuan, Nueva Ecija	No action taken.
14. Vault, Pasig, Rizal	Confer with District Engineer.
15. Kitchen Emergency Hospital, Cervantes, Ilocos Sur.	No action taken.



Bridge over the headworks, Peñaranda River Irrigation System

Projects assigned to Mr. Antonio Toledo, acting supervising architect

Manila projects	Status
1. Manila Post Office river wall	Working drawings completed. Full size details under way. Preliminary drawings submitted.
2. Bonifacio Monument	Working drawings completed.
3. Library, University of the Philippines	Working drawings 95 per cent completed.
4. Burnham Memorial	Alteration and repair completed.
5. Cavite Boulevard (Maytubig–Parañaque)	Planning, no action.
6. Forestry building	Addition and alteration, preliminary drawings under preparation.
7. Comfort station (Harrison Park)	Working drawings, no action.
8. Welfareville development plan	Planning under preparation.
9. Bureau of Science, laboratory addition	Preliminary drawings submitted.
10. Bureau of Agriculture, laboratory building	Preliminary drawings under preparation.
11. Bonifacio Monument layout	Planning under preparation.
12. Capitol building group	Drawing completed.

Provincial projects	Status
1. Government building, Occidental Negros	Working drawings completed. Full size details under way.
2. Mambucal Spring, Occidental Negros	Working drawings completed. Full size details under way.
3. General Rafael Crame Bridge	Tablet design completed.
4. Tuguegarao town planning	No action taken.
5. Government Building, Antique	Do.
6. Government Building, Ilocos Sur	Revision of plans completed.
7. Government Building, Bulacan	Preliminary drawings not started
8. Provincial tablet, Nueva Vizcaya Provincial Building.	Tablet design completed.
9. Candelaria Waterworks Tablet	Do.
10. Fountain, Iloilo metropolitan waterworks	Working drawings completed. Full size details completed.
11. Dalaguete waterworks	Tablet design completed.
12. Batangas provincial building wings	Revision of plans, full size details and tablet design completed.
13. Butuan Hospital	Alteration completed.
14. Numancia Rizal Monument	Working drawings 90 per cent completed.
15. Leyte town planning	Planning under way.
16. Cabanatuan Municipal Building	Working drawing completed. Full size details not started.
17. Iriga Jose Rizal Monument	Do.
18. Bais Jose Rizal Monument	Preliminary drawings submitted.
19. Paso Nanka waterworks reservation	Planning completed.
20. Plaza Washington, Daet, Camarines Sur	Do.
21. Tabaco market and tiendas	Tablet design completed.
22. Plaza Oton, Iloilo	No action taken.
23. Bulan layout, Sorsogon	Do.
24. Manhinao Bridge	Tablet design completed.
25. Calawag rain water tank	Do.
26. Revised Street System, Azcarraga M. R. R. Co., Tayuman, Rizal Avenue.	Planning completed.
27. Sampaloc waterworks	Tablet design under way.
28. Malasiqui Presidencia	Preliminary plan completed. (Addition).
29. Cabanatuan High School Extension	Preliminary drawings completed.
30. Severino Bridge, Occidental Negros	Tablet design completed.
31. Gumaca rain water tank	Do.
32. Rizal Monument, Catmon	Preliminary drawings submitted.
33. P. Aricheta Bridge	Tablet design completed.
34. Provincial Building, Tayabas	Design of alteration under way.
35. Provincial Dormitory Yard, Bohol	Planning completed.
36. Matias Hilado Bridge	Tablet design completed.
37. Senator Guanco Bridge	Do.
38. Don Teodoro Yulo Belleza	Do.
39. Standard School No. 3, two floors	Working drawings 80 per cent completed.
40. Misamis Provincial Building	Alteration of standard hospital No. 20, completed.
41. Bacong Jose Rizal Monument, Oriental Negros	Tablet design completed.
42. General Leon V. Kilat Namy, Occidental Negros	Do.
43. Improvement Town Plan, San Nicolas, Ilocos Norte.	Planning 85 per cent completed.
44. Mayantoc Presidencia, Tarlac	Location plan completed.

IRRIGATION DIVISION

NICANOR CORTES, *Chief Irrigation Engineer*

IRRIGATION PROJECTS

There were 6 irrigation projects under construction, 16 in operation, and 66 under consideration during 1927.

The 6 irrigation projects under construction command an aggregate area of 30,300 hectares and are estimated to cost completed ₱6,141,750. It is expected that 4 of these projects will be completed before the end of 1928.

The 16 Government irrigation systems in operation command an aggregate area of 61,000 hectares and were completed at a cost of ₱11,667,600.

Complete preliminary studies and estimates of cost for 12 projects were made during the past year. The Pampanga River Irrigation Project in Nueva Ecija Province, the Bulacan Irrigation Project and the extension of Amburayan River Irrigation System, both in La Union Province, which command an aggregate area of 25,000 hectares and are estimated to cost completed ₱4,400,000, are awaiting construction. After providing funds for these projects and for the improvements of existing systems, there will be left a balance of ₱736,023.95 for the construction of other projects from the ₱20,000,000 bond funds authorized by Acts 3011 and 3013.

A more detailed description of irrigation projects under construction, irrigation systems in operation, and projects under consideration is given hereunder.

PROJECTS UNDER CONSTRUCTION

Construction work was under way during the past year on the projects shown in Table II under the heading of "Systems Under Construction." The status of each of these projects is briefly described hereunder:

Peñaranda River Irrigation Project.—Progress on the excavation of main canal and laterals under contract with Mr. Sotero Baluyot, San Fernando, Pampanga, has been very slow, only 22 per cent of the work having been completed up to December 31, 1927. It was decided during the latter part of the year to import excavating machinery, by means of which it is expected better progress will be made. Work on the diversion works under contract with Mr. F. T. Ryan was 66 per cent completed. The construction of canal structures in Zone I, also under contract with Mr. F. T. Ryan, was 75 per cent completed. The canal structures in Zones II and III, under contract with Mr. S. Nagauye, were 70 per cent completed.

TABLE I.—*Irrigation systems in operation*

Name of system	Classification	Province	Date of official opening	Irrigated area	Cost of construction	Cost per hectare	Annual irrigation charges per hectare	Number of years to pay	Remarks
				Hectares					
1. Aganao River Irrigation System	Insular	Iloilo	September 1, 1924	6,000	₱917,000	₱152.96	₱11.66	40	
2. Amburayan River Irrigation System	...do	La Union	June 1, 1926	4,000	1,156,000	289.00	18.29	40	
3. Angat River Irrigation System	...do	Bulacan and Pampanga	July 1, 1926 May 1, 1926	22,000	5,000,000	229.47	15.11	40	
4. Ayala Irrigation System	Municipal	Zamboanga	February 1924	180	17,000	92.89	2.00	....	Operated by Municipal Council of Zamboanga.
5. Baruyen River Irrigation System	Insular	Ilocos Norte	July 15, 1923	550	89,000	161.52	8.72	40	
6. Dingras Irrigation System	...do	do	January 1, 1923	1,010	130,000	128.20	10.21	40	
7. Naic Irrigation System	...do	Cavite	January 7, 1923	680	292,000	431.95	22.26	40	Operated by Bureau of Lands.
8. O'Donnell River Irrigation System	...do	Tarlac	July 1, 1926	4,500	650,000	144.44	20.24	20	
9. Pilar Irrigation System	...do	Bataan	September 1, 1926	170	27,600	162.39	14.94	40	
10. Sta. Barbara Irrigation System	...do	Iloilo	December 1, 1922	4,850	692,000	142.70	10.21	40	
11. Sta. Maria Irrigation System	Municipal	Zamboanga	February 1924	430	23,000	53.39	2.00	Ind.	Operated by Municipal Council of Zamboanga.
12. San Miguel Irrigation System	Special	Tarlac	August 1913	4,000	789,000	197.25	Total, 29,000	Yearly	
13. Sibalom-San Jose Irrigation System	Insular	Antique	July 1, 1926	3,500	390,000	111.42	12.92	20	
14. Tagudin River Irrigation System	...do	Ilocos Sur	July 15, 1925	1,090	375,000	335.16	20.81	40	
15. Talavera River Irrigation System	...do	Nueva Ecija	November 15, 1923	7,890	1,080,000	146.84	9.20 2.50	40	
16. Trinidad Irrigation System	Special	Mountain Province	January 1921	200	40,000	200.00	....	....	Operated by Bureau of Education.
Total				61,050	11,667,600				

TABLE II.—*Irrigation systems under construction*

Name of system	Classification	Province	Date of beginning construction	Irrigable area	Estimated cost	Allotment made	Progress of construction	Remarks
				Hectares				
1. Angat River Irrigation System Extension	Insular	Bulacan	April, 1927	4,000	₱250,000	₱180,000	25% completed	To be completed June, 1928.
2. Dipolog Irrigation System	....do	Zamboanga	1920	1,000	126,750	76,750	61% completed	To be completed July, 1929.
3. Laoag-Vintar Irrigation System	....do	Ilocos Norte	January, 1923	6,200	2,280,000	2,080,000	74% completed	To be completed July, 1928.
4. Peñaranda River Irrigation System	....do	Nueva Ecija	January, 1924	18,000	3,300,000	2,634,185	55% completed	To be completed June, 1929.
5. Sibalom-San Jose Irrigation System Extension	....do	Antique	April, 1927	600	65,000	65,000	10% completed	To be completed June, 1928.
6. Talavera River Irrigation System Extension	....do	Nueva Ecija	April, 1926	1,500	120,000	110,000	30% completed	To be completed May, 1928.
Total				31,300	6,141,750	5,145,935		

It is believed that a portion of the system can be irrigated before the end of the year.

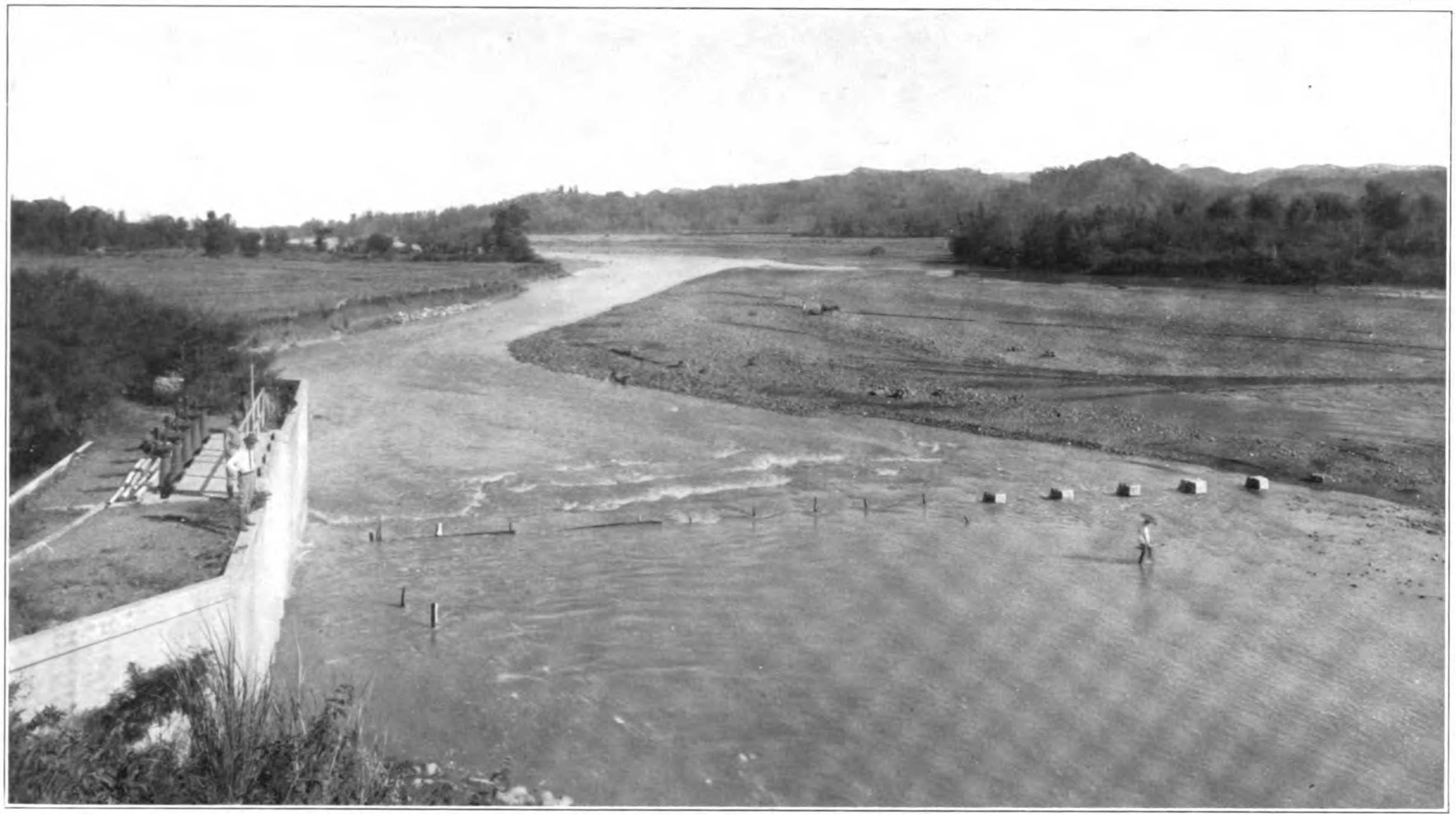
Laoag–Vintar Irrigation Project.—Investigations and studies were made of all possible solutions of the problems presented at the Vintar River dam site; the rock-fill dam constructed at this site having been seriously damaged before completion by floods during 1925, and about one-half of the dam washed out by floods during the 1926 rainy season. These solutions may be classified under three headings:

(1) Reconstruction with a rock-fill type of dam utilizing the knowledge gained during the 1925 and 1926 floods;

(2) Reconstruction with a gravity type of dam;

(3) Transferring the point of diversion approximately two kilometers up stream and using temporary brush dams for diverting water into the system during low stages of the river.

While it appeared to be feasible to reconstruct the dam using a rock-fill section at a considerable lower cost than a gravity type of dam, this plan was not in harmony with the recommendations of the Committees of Engineers appointed to report on the matter. Reconstruction work using a gravity type of dam was estimated to cost ₱1,750,000 while the cost of extending the north and south main canals approximately two kilometers up stream where low brush dams will have to be maintained during low stages of the river and water can be diverted from the natural level of the river during high stages, was estimated at ₱550,000. The latter plan has been recommended on account of the high cost of a gravity type dam and the fact that the funds invested in reconstruction work will not have to be reimbursed by the landowners. Furthermore, it was generally conceded that it would require two dry seasons to construct a gravity dam while the main canal extension work could be completed during the dry season of 1928 and water made available for the next rice crop. Recommendations submitted were pending approval at the end of the year.



Headgate Structure and Brush Dam, Sibalom–San Jose Irrigation System, Antique

Contract for the excavation of canals and construction of tunnels of the Pasuquin Extension was signed with Mr. Que Chu on December 13, 1927. Contract for the construction of canal structures and lining of tunnels was entered into with Mr. F. T. Ryan, who later assigned same to Mr. Que Chu.

An investigation was made of the failure of the dam by the Committee on Public Works of the House of Representatives. Results of its findings have not as yet been made public.

Extension of Talavera River Irrigation System.—Work on the construction of Dibabuyan Diversion Works and on the construction of canals of the extension of Talavera River Irrigation System, under contract with Mr. Pedro Siochi, was about 30 per cent completed at the close of the year. It is expected that all work on the extension will be completed before the next growing season.

Extension of Angat River Irrigation System.—Some of the canals included in the extension of Angat River Irrigation System were completed before the opening of the 1927 growing season and thus served an additional area of approximately 1,000 hectares. Bids will soon be called for the construction of the remaining canals and structures with a view to completing same before the next growing season and irrigating the total area of 4,000 hectares included in the extension.

Extension of Sibalom–San Jose Irrigation System.—No bids were received for the construction of canals and structures of the extension of Sibalom–San Jose Irrigation System. The work, which is now being done by administration, is expected to be completed before the next growing season.

Dipolog Irrigation System.—The construction of additional laterals and of drainage ditches was found to be necessary before the system could be placed in a good operating condition. Construction work will be undertaken as soon as an additional allotment of ₱50,000 is released.

IRRIGATION SYSTEM IN OPERATION

Of the 16 Government irrigation systems in operation, only 12 were administered by this Bureau. The Naic System was operated by the Bureau of Lands, the Trinidad System by the Bureau of Education, and the Santa Maria and Ayala Systems by the Municipal Council of Zamboanga. A list of all the Government irrigation systems in operation is shown in Table I.

In the Dingras Irrigation System the main canal was cleaned out, and a siphon was built under Curipat Creek.

There was still considerable leakage from the main canal and laterals of the Baruyen River Irrigation System. As there was crop shortage even on well irrigated lands, and same could not consequently be attributed to deficiency in the water supply, an inquiry is now being made of the causes of the crop shortage.

Diversion of water from the Tipulan River into the main canal of Sibalom–San Jose Irrigation System was accomplished with considerable difficulty, on account of the low water channel shifting away from the headworks after floods. The experience gained during the last two years indicates the advisability of building a permanent dam at the point of diversion.

Improvement of the headworks for the O'Donnell River and San Miguel Irrigation Systems was carried out.

The crop harvested from all the irrigated lands, with the exception of the those served by the Baruyen River Irrigation System, was, as a general statement, very good despite a rather poor distribution of rainfall and the prevalence of stem borers and cutworms in the provinces of Antique, Iloilo, Tarlac, and Bulacan. The efficiency of irrigation water as a means of controlling and exterminating rice pests was demonstrated during the past year.

The campaign of education and demonstration started during the latter part of 1925 to improve farm practice, to encourage the use of better seeds, and to induce farmers to coöperate in the campaign of extermination of rice pests was continued during the past year with gratifying results. The landowners began to coöperate with the operation and maintenance employees of this Bureau in the fight against insect enemies of the rice plant. Governor Salvani of Antique declared a rice pest week. At the suggestion this Office, experiments were made on good varieties of rice by landowners. Some of them have been found well adapted to the lands served by irrigation systems. Prominent among these varieties is the *Bamai* introduced by the Bureau of Agriculture. With the widespread use of this variety in the irrigated districts it is expected rice production will be further increased. The present aim is to disseminate information on the advantages of the Bamai variety.

To promote dry season farming in irrigated districts is one of the main objectives of the campaign, which has been launched by this Office, for education and demonstration among the farmers using Government irrigation systems.

IRRIGATION SYSTEMS UNDER CONSIDERATION

The Tarlac River Irrigation Project was approved for construction during the past year. The landowners affected, however, demanded a reduction of the advertised irrigation charges which caused the abandonment of the project.

Complete preliminary studies and estimates of cost were made on 12 irrigation projects. The following table gives the location, approximate irrigable area, and status of the more important projects under consideration:

Province	Project	Irrigable area	Status
		Hectares	
Abra	Abra River	4,000	Awaiting investigation.
Albay	Quinali–Lake Bato	6,000	Do.
Do	Malinao-Tabaco	600	Do.
Camarines Norte	Daet	2,000	Topographic survey completed.
Do	Talisay–Indan	5,000	Do.
Camarines Sur	San Jose–Hagonoy	5,000	Awaiting investigation.
Do	Pauili Valley	2,000	Topographic survey completed.
Do	Barit River	2,000	Awaiting investigation.
Bataan	Dinalupihan	2,500	Do.
Do	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
Do	Mambusao	1,000	Preliminary investigation, 1911.
Do	Macato–Malinao	1,200	Do.
Do	Ibahay	500	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Do.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
Do	Candon	1,300	Studies completed. Estimated cost, ₱134,000.
Do	Santa Cruz	1,200	Studies completed. Estimated cost, ₱257,000.
Do	Santa Lucia	1,400	Studies, completed. Estimated cost, ₱106,000.
Cebu	Balamban River	1,200	Awaiting investigation.
Batangas	Batangas	1,000	Investigation in progress.
Do	Balayan	300	Do.
Do	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	15,800	Estimated cost, ₱4,500,000.
Do	Pototan	2,300	Survey and preliminary design made.
Do	Sibalom River	1,750	Estimated cost, ₱264,500.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz	5,000	Estimated cost, ₱1,330,000.
La Union	Balaoan	1,050	Studies completed. Estimated cost, ₱200,000.
Do	Bacnotan	500	Studies completed. Estimated cost, ₱243,000.
Do	Agoo–Tubao	2,000	Awaiting investigation.
Do	Naguilian	1,000	Preliminary survey completed.
Do	Rosario	1,000	Topographic survey completed.
Do	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	755	Estimated cost, ₱241,000.
Do	Palo	1,000	Preliminary investigation completed.
Do	Dagami-Tanauan	14,000	Awaiting investigation.
Do	Bato Hilongos	3,000	Awaiting investigation.
Mindoro	Bucayao River	2,000	Do.
Nueva Ecija	Pampanga River	22,500	Studies completed. Estimated cost, ₱4,000,000.
Nueva Vizcaya	Murong	1,200	Topographic survey completed.
Occidental Negros	Binalbagan–Himamaylan	3,000	Do.
Do	Bago	20,000	Preliminary estimate of cost made.
Do	Silay	5,000	Awaiting investigation.
Oriental Negros	La Granja Ext. Station	200	Investigation in progress.
Do	Tanjay	800	Awaiting investigation.
Do	Tolong	3,000	Preliminary investigation made.
Palawan	Iwahig	700	Studies completed. Estimated cost, ₱85,000.
Pampanga	Porac	1,000	Topographic survey completed.
Do	Bamban	3,000	Do.
Do	Gumain	5,000	Do.
Pampanga	Lower Pampanga	11,000	Estimated cost, ₱3,800,000.
Pangasinan	Agno	40,000	Topographic survey completed.
Do	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do	San Fabian	4,000	Do.
Do	Banila	5,000	Topographic survey completed.
Rizal	Baras	320	Estimated cost, ₱58,000.
Do	Mariquina Valley	5,000	Topographic survey completed.
Do	Morong	320	Estimated cost, ₱72,500.
Do	Pililla	300	Estimated cost, ₱60,000.
Tarlac	Tarlac	25,000	Studies completed. Estimated cost, ₱4,200,000.
Tayabas	Mayao	2,500	Awaiting investigation.
Zambales	Santo Tomas	9,000	Preliminary estimate of cost made.
Do	Toton-Lanom	600	Preliminary survey completed.
Do	Iba	400	Do.

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the division made 2,451 discharge measurements and kept daily gage height records at 239 permanent gaging stations. Thirty-four discharge measurements were made at temporary stations during 1927. Records were also kept for 31 rain gages established in localities distant from the Weather Bureau's gages.

WATER RIGHTS

A total of 240 new applications for water rights was received during the year, 233 of which were for irrigation, 2 for domestic, one for condensation, and 4 for power development purposes. A total of 117 applications was finally acted upon, 107 of which were granted and 10 disapproved by the Honorable, the Secretary of Commerce and Communications upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 24,073.40 hectares of land.

There were four applications for power development filed during 1927. Five applications for power development were approved for developing a maximum of 712 horse power.

Four streams were designated for adjudication during the year 1927.

Adjudication on 3 streams was completed in 1927, making the total number of streams so adjudicated, 27.

Provisional lists of priorities for the following streams, which have been surveyed and investigated, are being prepared:

Streams	Year adjudication authorized	Province	Number of diversion ditches	Length of main canal	Number of municipalities affected	Approximate area of land irrigated
				Meters		*Hectares*
Ange and Gogo Rivers	1913 1919	Pampanga	25	970	4	3,200
Parasapas Creek	1916	Pangasinan	2	500	2	1,500
Banila River	1919	do	50	10,000	4	25,000
Malabago or Anondaan River.	1920	do	5	3,000	4	1,000
Andulan or Burubor River	1921	do	30	1,000	2	1,300
Bued or Nantayangan River.	1922	Nueva Ecija and Pangasinan.	10	1,000	2	2,500
Total						34,500

Surveys are in progress with surveying parties in the field on the following streams:

Streams	Year	Province	Municipality affected	Approximate area of land irrigated
				Hectares
Gogo and Buge Esteros	1918	Tarlac	Concepcion	3,000
Parua River	1924	Pampanga and Tarlac.	Mabalacat, Banban and Concepcion.	8,000
Total				11,000

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream	Year adjudication authorized	Province	Municipality affected	Approximate area of land irrigated
				Hectares
Inarihan River	1915	Camarines Sur	Naga, Magarao and Calabanga.	1,200
Balingasay River	1919	Ilocos Norte	Sarrat	300
Banglayan River	1922	Ilocos Sur	Narvacan	2,200
Codoog or Barangabong River.	1922	do	Narvacan and Nagbukol.	1,000
Piao Estero	1922	Tarlac	Moncada and San Manuel.	5,000
Nagubunban Estero	1923	Ilocos Norte	Badoc	300
Ananduyan or Aloragar River.	1924	Pangasinan	Mapandan, Manaoag, Binalonan, Pozorrubio, and Sison.	5,000
Del Carmen	1924	Pampanga	San Fernando and Mexico.	5,000
Matua Creek	1924	do	Santa Rita, Guagua, Bacolor, and Porac.	800
Labasin and Bulaquin Rivers.	1925	Tayabas and Laguna	Tiaong, Dolores, and San Pablo.	300
Lusuac Spring	1926	Abra	Bangued and Peñarubia.	300
Lagasit River	1926	Pangasinan	Tayug, Santa Maria, San Quintin, Rosales, and Balungao.	2,000
Santa Maria or Villavieja River.	1926	Ilocos Sur and Abra	Narvacan, Santa Maria, and Pilar.	2,000
San Juan River	1926	Bataan	Samal	300
Paed River	1926	Pangasinan	Alaminos	300
Talavera River	1927	Nueva Ecija	Caranglan, Muñoz, Santo Domingo, Talavera, Quezon, Aliaga, and Zaragoza.	9,000
Gasgas River	1927	Ilocos Norte	Solsona	551
Caagusan Balucao and Paligue Creek.	1927	Tarlac	Concepcion	2,000
Mitura and Macalong Rivers.	1927	Pangasinan	San Manuel, Asingan, Binalonan, Villasis, and Mapandan.	
Total				43,551

RIVER CONTROL PROJECTS

There were sixty river control projects under consideration during 1927, but funds were available for only the sixteen shown in the table below.

Name	Province	Municipality	Estimated cost	Type of work	Remarks
1. Calacran River Control	Albay	Libon	₱40,000	Dyke and sausage boulder Dam.	Under construction.
2. San Francisco River Control	do	Guinobatan	7,000	Channel and boulder dam	Do.
3. Calumpang River Bank Revetment	Batangas	Batangas	40,000	Concrete bank revetment.	Completed.
4. North Protection Dyke, Angat River I. System	Bulacan	Baliuag	24,000	Earth dyke	Under construction.
5. South Protection Dyke, Angat River I. System	do	Quingua-Bustos	30,000	do	Do.
6. Danao Sea Wall Protection	Cebu	Danao	20,000	Concrete sea wall	Ready to be advertised for construction.
7. San Cristobal River Control	Laguna	Calamba	31,000	Concrete bank revetment.	Do.
8. Amburayan River Causeway	La Union	Amburayan	25,000	Concrete causeway	Advertised for construction.
9. Pampanga River Dyke	Pampanga	San Simon, Arayat, San Luis, and Apalit.	25,000	Earth dyke	Maintenance.
10. Potrero and Abacan River Control	do	Santa Rita, Angeles, Bacolor, and Guagua.	60,000	Channel improvement	Under construction.
11. Bayambang Dyke and bank revetment	Pangasinan	Bayambang	100,000	Earth dyke and revetment	Ready to be advertised for construction.
12. Caca-Galarin Dyke	do	do	60,000	Earth dyke	Completed.
13. Galarin-Urbiztondo Dyke	do	Urbiztondo	35,000	do	Ready to be advertised for construction.
14. Protection work for Plaridel Bridge	do	Rosales	3,000	Brush dam	Do.
15. Protective Dyke No. 2	Tarlac	San Miguel	16,000	Earth dyke	Under construction.
16. Sariaya River Control	Tayabas	Sariaya	25,000	Channel improvement	Do.
Total			541,000		

SEWERAGE SYSTEMS

The construction of the Lucena Storm Drain System in Tayabas Province, started during 1925, was reported 88 per cent completed at the end of the year. Sewer lines, curbs, and gutters have been laid in the main streets of the *población*. The system is estimated to cost ₱100,000 when completed. The sum of ₱30,000 from municipal funds and ₱75,000 from insular appropriations have been allotted to this project.

Preliminary plans and estimates of cost have been prepared for the following projects;

1. Cavite storm drain system, Cavite Province	₱80,000
2. Cavite domestic sewer system, Cavite Province	95,000
3. Cebu domestic sewer system, Cebu Province	440,000
4. Lucena domestic sewer system, Tayabas Province	120,000
5. Vigan domestic sewer system, Ilocos Sur Province	110,000
Total	825,000

A bond issue has been authorized for financing the construction of the Vigan Sewer System and it is expected that steps will be taken by other municipalities concerned for financing projects by means of bond issues.

WATERWORKS

The division prepared plans and specifications for 32 municipal waterworks projects on which construction work was started during 1927. These projects will furnish potable water to a total population of 144,325, at an estimated cost of ₱2,438,150. Preliminary designs and estimates were also made for 41 provincial and municipal waterworks projects, most of which are to be financed from loans. These projects will supply 100,000 people, at an estimated cost of ₱1,480,000.

Construction work was completed by district engineers on 19 waterworks projects started during the previous year, leaving 54 projects under construction at the end of the year. The completed projects cost ₱373,446 and serve a total population of 44,000, while the 54 projects still under way are estimated to cost ₱5,286,950 and will provide a potable water supply for 300,000 people. The largest project undertaken up to the present time, excepting the Manila Metropolitan Water System, is the Iloilo Metropolitan Waterworks. The work completed at the end of the year consisted of the diversion weir, main pipe line and the distribution systems of the municipalities of Iloilo and Jaro. Said municipalities have been supplied with water since October 1, 1927. The pipe and other materials required for the other large projects, such as the Ilocos Norte Metropolitan

Flume over San Roque Creek, Lateral A Extension, Sibalom–San Jose Irrigation System, Antique Province

Waterworks, Ilocos Norte; Legaspi–Daraga Waterworks, Albay; and Bacolod Waterworks, Occidental Negros, were imported from the United States and Europe during the latter part of the year.

There are 111 waterworks projects under consideration which contemplate furnishing water to a total population of 346,000 and are estimated to cost approximately ₱5,539,000. As soon as the municipalities concerned are able to finance these projects, construction work may be undertaken, excepting a few projects which require further investigation.

There have been completed thus far 163 municipal and provincial water supply systems in the Philippine Islands, excluding the Manila Metropolitan Water System, which furnish potable water to a total population of 523,000 and have cost ₱6,069,094.36

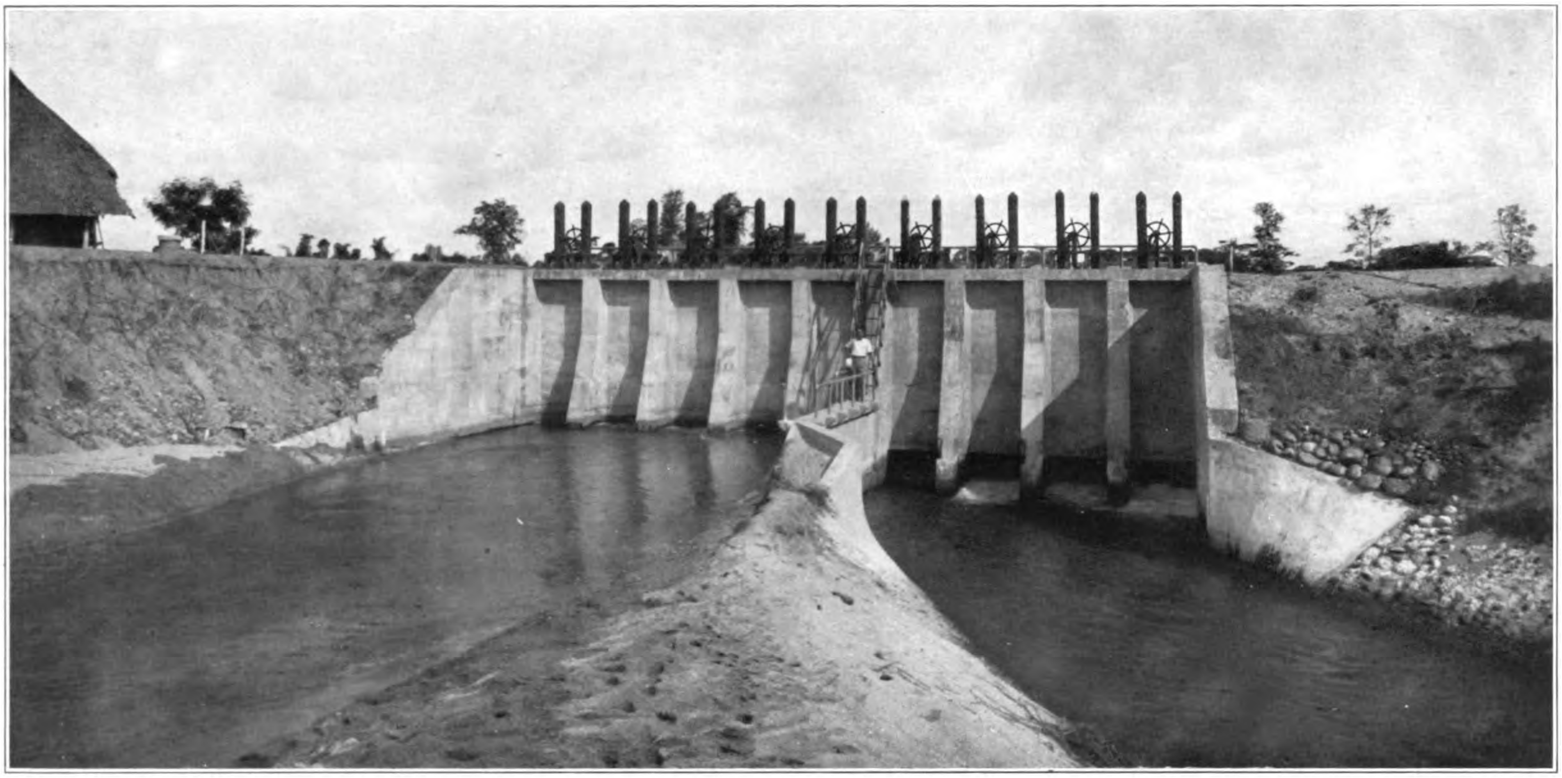
The status of all waterworks projects to date is shown in the accompanying lists as follows:

Table A.—Waterworks projects under construction.
Table B.—Waterworks projects completed.
Table C.—Waterworks projects under consideration.

TABLE A.—*Waterworks projects under construction*

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Albay	Daraga-Legaspi [a]	Gravity	20,000	₱250,000	₱50,000	₱50,000.00
Do	Tabaco	do	5,500	45,000	26,000	15,000.00
Antique	Culasi	do	1,700	30,000	20,000	10,000.00
Do	Sibalom [a]	do	2,500	27,000	18,000	9,000.00
Batangas	Lian [a]	do	2,000	4,500	3,000	1,500.00
Bohol	Loon	do	5,000	33,000	22,000	11,000.00
Bulacan	Bulacan [a]	Pumping	6,000	80,000	25,000	12,500.00
Do	Malolos	do	6,000	125,000	83,000	41,526.45
Do	Marilao [a]	do	1,200	6,000	4,000	2,000.00
Do	San Miguel [a]	do	7,000	75,000	50,000	25,000.00
Cagayan	Tuguegarao	Gravity	10,000	200,000	25,000	112,500.00
Cavite	Cavite	Pumping	10,900	120,000	49,000	77,035.79
Cebu	Alegria [a]	Gravity	1,000	24,000	6,200	5,889.00
Do	Carcar Improvement	do	4,000	30,000	5,000	10,000.00
Do	Danao [a]	do	2,500	42,000	25,000	17,000.00
Do	Moalboal Extension [a]	do	3,000	25,200	....	8,400.00
Do	Sogod [a]	do	2,200	13,500	9,000	4,500.00
Iloilo	Iloilo Metropolitan waterworks	do	91,500	2,100,000	222,000	1,585,438.56
Do	Pototan–Dingle [a]	do	9,200	279,000	40,000	168,659.78
Do	San Dionisio [a]	do	1,500	15,000	10,000	6,078.92
Ilocos Norte	Badoc	Pumping	2,800	37,000	24,500	12,418.50
Do	Ilocos Norte Metropolitan waterworks [a]	Gravity	34,300	750,000	84,000	425,794.90
Ilocos Sur	Bantay	do	2,500	9,000	4,000	2,557.49
Do	Caoayan [a]	do	1,700	13,500	9,000	4,500.00
Do	San Vicente [a]	do	2,000	32,000	8,800	4,400.00
Do	Santa Catalina [a]	do	1,500	30,000	11,200	5,600.00
Do	Santa [a]	do	875	24,000	16,000	8,000.00
Laguna	Luisiana	do	4,500	48,000	32,000	16,000.00

[a] Projects started in 1927.



Common Headworks, O'Donnell River and San Miguel Irrigation Systems, Tarlac Province

(Left, O'Donnell Main Canal; Right, San Miguel Main Canal)

TABLE A.—*Waterworks projects under construction*—Continued

Province	Municipality	Type of syetem	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Laguna	Magdalena	Gravity	3,000	₱68,000	₱42,400	₱21,210.79
Do	Paete [a]	do	4,500	18,000	7,000	6,000.00
La Union	Rosario [a]	do	1,050	10,000	6,600	3,570.14
Masbate	Aroroy [a]	do	1,000	8,000	5,000	3,000.00
Marinduque	Torrijos	do	5,000	24,000	16,000	8,000.00
Misamis	Cagayan Improvement [a]	do	5,000	38,000		34,339.25
Mountain Province	Bontoc [a]	do	2,000	36,000	24,000	12,000.00
Do	Lubuagan	do	1,200	8,000	5,000	
Occidental Negros	Bacolod [a]	do	8,000	202,000	50,000	112,441.24
Oriental Negros	Bacong [a]	do	1,800	27,000	17,000	10,000.00
Do	Libertad	do	1,600	40,800	25,000	12,500.00
Palawan	Bacuit	do	1,000	3,200	2,500	700.00
Do	Balaba extension	do	800	5,000	3,200	
Do	Barrio Bintuan	do	1,000	5,500	3,700	1,000.00
Do	Culion	Gravity and pumping	5,000	45,000	39,000	
Do	Cuyo	Pumping	800	10,000	6,650	3,000.00
Do	Oton	Gravity	330	5,000	3,000	
Do	Puerto Princesa improvement	Pumping	400	3,300	2,200	
Romblon	Odiongan [a]	Gravity	3,000	45,000	16,000	15,000.00
Sorsogon	Gubat [a]	do	7,000	90,000	50,000	27,000.00
Tayabas	Guinayangan [a]	do	1,500	21,000	5,600	13,000.00
Do	Lucena improvement [a]	do		30,000		6,000.00
Do	San Narciso [a]	do	1,000	15,000	10,000	6,071.50
Do	Catanauan [a]	Rain tank		4,800		4,402.00
Do	Laguimanoc [a]	do		2,650		2,650.00
Zambales	San Antonio	Gravity	4,000	54,000	25,000	(b)
Total			302,855	5,286,950	1,246,650	2,954,184.31

[a] Projects started in 1927.

TABLE B.—*Waterworks projects completed*

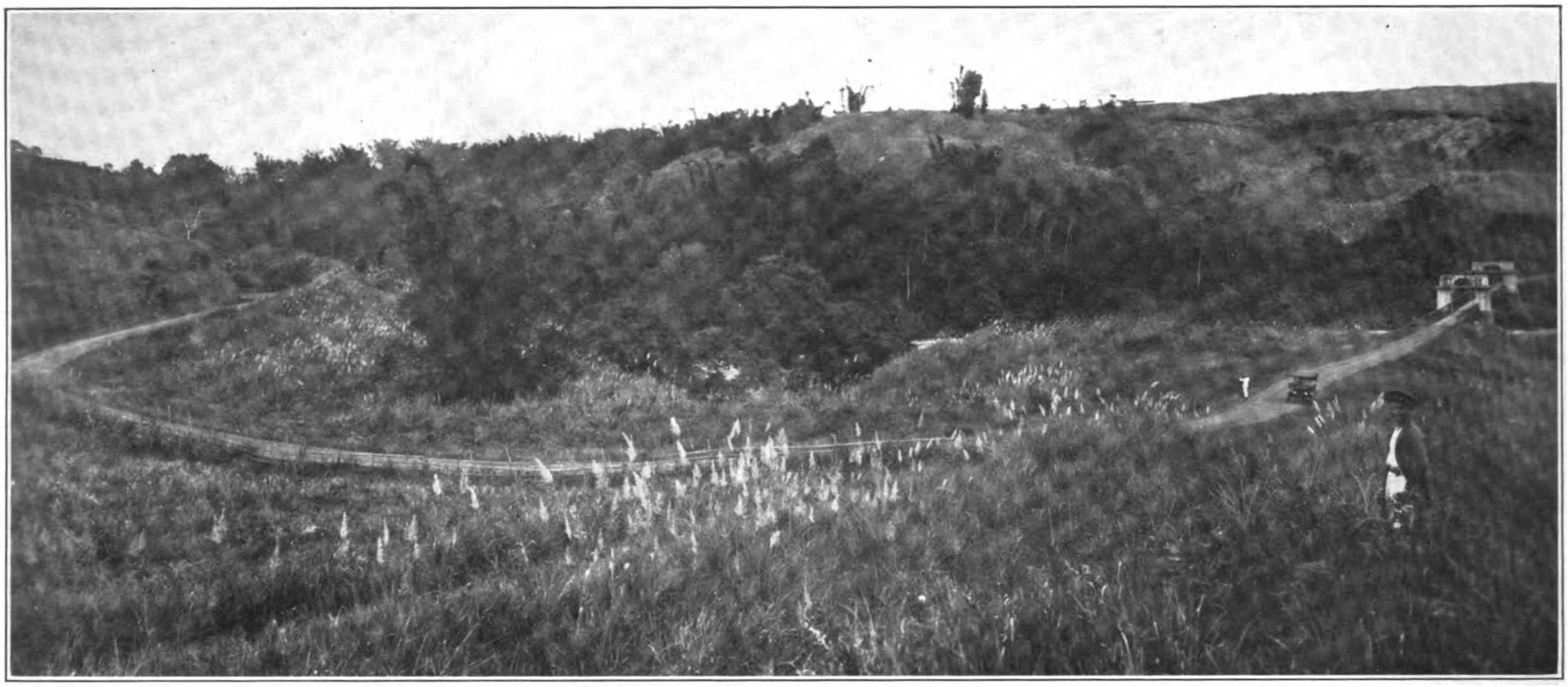
Province	Municipality	Cost	Population served	System	Capacity of system per day
					Gallons
Abra	Bangued	₱130,755.85	6,600	Gravity	180,000
Albay	U. S. Reservation Regan Barracks and Legaspi.	60,000.00	5,000	Pumping	259,200
Do	Camalig [a]	12,450.38	2,500	Gravity	100,000
Do	Guinobatan	49,853.81	5,000	do	288,000
Do	Guinobatan Extension.	1,791.42			

[a] Projects started in 1927.

TABLE B.—*Waterworks projects completed*—Continued

Province	Municipaiity	Cost	Population served	System	Capacity of system per day
					Gallons
Albay	Jovellar [a]	₱13,140.31	2,500	Gravity	122,400
Antique	Bugason	18,306.56	2,500	do	44,000
Do	San Jose	41,846.74	4,000	Pumping	47,520
Bataan	Sisiman [a]	12,138.04	(Cattle)	Gravity	37,000
Batangas	Balayan	7,353.92	2,000	do	100,000
Do	Batangas	71,529.96	6,147	Pumping	144,000
Do	Bauan	41,983.96	4,700	do	93,600
Do	Cuenca	5,000.00	2,500	Gravity	5,040
Do	Lemery	47,132.84	7.200	Pumping	200,000

[a] Projects started in 1927.



Km. 9, Overton-Keithley Road, Lanao, Mindanao

TABLE B.—*Waterworks projects completed*—Continued

Province	Municipality	Cost	Population served	System	Capacity of system per day
					Gallons
Batangas	Lipa	₱103,065.87	5,000	Pumping	172,800
Do	Rosario	20,232.67	5,000	do	223,200
Do	San Jose	44,099.45	4,000	Gravity	216,000
Do	Santo Tomas	27,106.65	1,910	do	50,400
Do	Taal	91,188.34	5,000	Pumping	187,200
Do	Taal extension	57,220.41	4,000	do	80,000
Do	Talisay	15,562.81	2,130	Gravity	64,800
Do	Tanauan	55,615.02	2,500	do	45,000
Bohol	Anda [a]	16,429.84	2,500	do	100,800
Do	Calape	26,521.41	2,600	do	156,000
Do	Dauis	5,100.00	840	do	86,400
Do	Duero	10,823.56	2,000	do	77,760
Do	Inabanga [a]	45,362.63	4,000	do	160,000
Do	Jagna	24,115.26	3,000	do	43,200
Do	Loay	18,968.72	3,000	do	144,000
Do	Loboc [a]	20,063.91	3,000	do	61,900
Do	Mabini	6,750.00	1,300	do	72,000
Do	Tagbilaran	13,837.47	5,245	Pumping	77,760
Do	Tubigon	37,094.06	4,800	do	100,800
Bukidnon	Deliric	(No data)	600	Gravity	4,320
Do	Malaybalay	11,641.16	1,300	do	20,160
Do	San Luis	650.00	500	do	
Bulacan	Hagonoy	7,564.87	2,789	do	50,400
Do	Marilao	22,101.50	Bath-house	do	
Do	Sibul, San Miguel.	256,000.00	do	do	
Camarines Norte	Mambulac	1,200.00	1,823	do	
Do	Paracale	8,544.03	2,500	do	100,800
Capiz	Capiz	13,541.92	6,400	do	264,170
Cavite	Indang	39,627.40	3,000	Pumping	144,000
Do	Mendez-Nuñez	60,700.00	1,600	do	57,600
Do	Silang	36,154.89	4,000	Gravity	100,000
Cebu	Balamban [a]	25,009.14	4,800	do	72,200
Do	Barili	26,958.28	2,067	do	61,200
Do	Carcar	64,004.45	4,463	do	216,000
Do	Catmon	16,399.56	1,624	do	38,000
Do	Cebu	526,000.00	65,000	do	806,400
Do	Cebu-Labangon	16,000.00			576,000
Do	Cebu-Sambag	35,789.18		Pumping	187,200
Do	Cordova	4,810.74	1,191	Gravity	30,000
Do	Daanbantayan	5,672.99	579	do	30,000
Do	Dalaguete	14,941.15	3,500	Pumping	36,000
Do	Dalaguete Extension.	27,372.84		Gravity	57,600
Do	Dumanjug	35,639.29	1.500	Pumping	187.200
Do	Ginatilan	13,404.80	2,669	Gravity	43,200
Do	Mainit	2,000.00		do	
Do	Malabuyoc	14.941.15	1.500	do	104.540
Do	Moalboal	14.297.27	2,108	do	54.720
Do	Naga	6,800.00	3,233	do	79,200
Do	Naga extension	4,552.48		do	
Do	Opon	36.568.44	1.500	Pumping	144.000
Do	Pilar	5,019.21	702	Gravity	14,400
Do	Poro	8.873.63	1.000	do	21.600

[a] Projects completed in 1927.

TABLE B.—*Waterworks projects completed*—Continued

Province	Municipality	Cost	Population served	System	Capacity of system per day
					Gallons
Cebu	Samboan	₱7,514.11	2,741	Gravity	49,250
Do	San Isidro	1,388.13	650	do	34,560
Do	San Fernando	20,273.17	3,000	do	108,000
Do	San Francisco	6,200.00	1,245	do	10,000
Do	Sibonga	35,300.00	2,661	do	63,360
Do	Tuburan	55,335.55	3,900	do	120,960
Do	Tudela	8,263.29	851	do	24,480
Cotabato	Parang	9,600.00	600	Pumping	21,600
Davao	Davao	137,195.14	5,000	Gravity	85,400
Ilocos Sur	Vigan	127,399.52	8,440	do	201,600
Isabela	Ilagan			Rain tank	40,000
Laguna	Alaminos	28,496.85	1,130	Gravity	95,000
Do	Bay	2,767.72	1,471	do	86,400
Do	Calamba	75,275.98	7,000	Pumping	288,000
Do	Lilio	35,528.77	4,500	Gravity	316,800
Do	Majayjay	38,686.06	3,200	do	187,200
Do	Nagcarlang	36,034.42	2,500	do	180.000
Do	Pagsanjan	73,782.67	4,044	Pumping	233,280
Do	Rizal [a]	26,777.56	3.000	Gravity	216,000
Do	San Pablo	89,455.82	7,000	do	576,000
Do	Santa Cruz	92,692.43	6,000	Pumping	352,800
La Union	San Fernando	92,732.94	5,000	Gravity	300,000
Leyte	Baybay [a]	72,889.23	8,000	do	136,000
Do	Liloan [a]	7,483.63	700	do	28,800
Marinduque	Boac	6,653.00	1,000	Pumping	57,600
Do	Gasan	22,124.97	1,400	do	144,000
Do	Malbog	13,614.29	1,000	Gravity	61,920
Do	Mogpog	10,535.69	1,280	do	18,288
Do	Santa Cruz	20,696.23	2,560	do	158,400
Mindoro	Abra de Ilog	4,743.74	350	do	14,400
Do	Bulalacao	3,232.08	700	do	43,200
Do	Calapan	29,743.47	2,500	Pumping	57,600
Misamis	Balingasag	8,924.14	1,514	Gravity	57.600
Do	Cagayan	50,408.82	3,000	Pumping	86,400
Do	Mahinog	6,000.00	5,727	Gravity	
Do	Mambajao	30,000.00	14,446	do	
Do	Sagay	800.00	6,321	do	
Mountain Province.	Baguio	229,605.89	6,000	Pumping and gravity.	350,000
Do	Cervantes	7,565.07	800	Gravity	
Do	Mansion House	2,144.58	100	Pumping	40,000
Do	Teachers' Camp		1,500	do	216,000
Do	Trinidad Farm School.	19,330.93	300	Gravity	36,000
Do	Trinidad Stock Farm.	2.000.00	60	do	8,640
Nueva Ecija	Cabanatuan	111,302.49	6,000	Pumping	100,000
Do	Muñoz Agricultural School.	10,000.00	1,000	do	86,400
Oriental Negros	Basac		265	do	
Do	Dauin	22,296.01	1,500	Gravity	57,600
Do	Dumaguete	84,131.43	4,000	Pumping	288,000
Do	Guihulngan [a]	22,284.76	3,500	Gravity	144,000
Do	Larena				
Do	Lazi	6,980.77	2,300	do	

[a] Projects completed in 1927.

Km. 7, Jolo–Parang–Camp Romondier Junction Road, Sulu

TABLE B.—*Waterworks projects completed*—Continued

Province	Municipality	Cost	Population served	System	Capacity of system per day
					Gallons
Oriental Negros	Luzuriaga	₱12,317.44	2,500	Gravity	269,200
Do	Maria	1,350.05	1,000	do	7,400
Do	Maria Extension.	2,677.41			
Do	Siquijor	18,000.00	1,587	do	
Do	Siquijor Extension.		494	do	
Do	Talingting	5,025.00	2,890	do	6,480
Do	Vallehermoso [a]	18,655.17	2,500	do	115,200
Palawan	Coron	7,844.63	1,150	Pumping	20,160
Do	Puerto Princesa	10,268.45	716	do	28,800
Pampanga	Angeles	12,318.52	6,708	Pumping	61,920
Do	Arayat	35,180.95	3,840	Gravity	144,000
Do	San Fernando	1,050.02	1,000	Pumping	86,400
Pangasinan	Alcala	3,000.00	2,200	Gravity	129,600
Do	Bani	12,411.86	2,000	do	86,400
Do	Bayambang	8,652.80	2,400	do	108,000
Do	Dagupan	2,823.02	Market.	do	
Do	Lingayen	3,938.99	do	do	
Do	Lingayen	9,141.22	School	do	
Do	Lingayen	96,682.22	7,000	Pumping	288,000
Do	Mangaldan	635.53	Market	Gravity	122,400
Do	San Fabian	682.87	do	do	57,600
Do	San Manuel [a]	38,267.76	4,000	do	28,800
Rizal	Antipolo	23,299.07	2,250	Pumping	82,080
Do	Pasig	40,000.00	10,000	do	86,400
Romblon	Looc	27,760.12	2,000	Gravity	144,000
Do	Romblon		2,300	do	
Samar	Calbayog		Market	do	20,000
Do	Catbalogan	64,308.94	2,000	do	55,000
Do	Oras		4,000	do	
Sorsogon	Bacon	21,000.00	3,200	do	79,200
Do	Magallanes	8,000.00	3,500	Pumping	
Do	Sorsogon	70,701.49	6,000	Gravity	206,000
Do	do	1,044.67	250	Pumping	36,000
Sulu	Jolo	76,974.29	5,000	do	115,200
Surigao	Bo. Bacuag, Gigaquit.	7,500.00	2,405	Gravity	
Do	Lianga	1,924.58	1,290	do	2,880
Do	Placer	13,133.95	870	do	18,720
Tarlac	Moncada	22,122.26	3,000	do	86,400
Tayabas	Candelaria	60,646.04	3,500	do	216,000
Do	Infanta	4,424.55	1,200	Rain tank	40,000
Do	Calauag [a]	4,933.53		do	40,000
Do	Gumaca	4,482.17	1,600	do	40,000
Do	Lucban	50,205.60	3,200	Gravity	316,800
Do	Lucena	234,390.57	7,500	do	262,000
Do	Mauban	57,209.32	3,500	Pumping	144,000
Do	Mulanay	17,369.53	1,200	Gravity	180,000
Do	Pagbilao	70,538.47	2,300	do	54,700

[a] Projects completed in 1927.

TABLE B.—*Waterworks projects completed*—Continued

Province	Municipality	Cost	Population served	System	Capacity of system per day
					Gallons
Tayabas	Quezon [a]	₱2,989.62		Rain tank	20,000
Do	Pitogo [a]	5,326.57		do	40,000
Do	Sariaya	37,935.00	6,000	Gravity	201,600
Do	Tayabas	125,159.35	4,600	do	173,000
Do	Unisan [a]	4,490.89		Rain tank	40,000
Do	Tiaong	49,694.74	1,800	Gravity	187,200
Do	Sampaloc [a]	22,957.61	3,000	do	129,600
Zambales	Subic	10,670.62	1,628	do	11,520
Zamboanga	Zamboanga	305,561.30	5,000	do	504,000
Total		6,069,094.36	523,252		

[a] Projects completed in 1927.

TABLE C.—*Waterworks projects under consideration*

Province	Municipality	Estimated cost	Population to be served	System
Albay	Libog [a]	₱28,000.00	3,000	Gravity.
Do	Ligao	244,000.00	6,000	Do.
Do	Oas		6,000	Do.
Do	Libon	244,000.00	3,000	Do.
Do	Polangui		8,000	Do.
Antique	Barbaza [a]	24,000.00	1,500	Do.
Do	Dao [a]	18,000.00	1,100	Do.
Do	Pandan [a]	24,000.00	1,500	Do.
Do	Patnongon	15,000.00	1,000	Do.
Do	San Jose Extension	40,000.00	1,500	Pumping.
Batanes	Itbayat	15,000.00	1,000	Gravity.
Do	Ivana	50,000.00	2,000	Do.
Do	Uyugan		1,500	Do.
Batangas	Batangas	400,000.00	10,000	Do.
Do	Bauan		5,200	Do.
Do	Ibaan		2,700	Do.
Do	San Jose		2,100	Do.
Do	Lobo [a]	12,000.00	1,000	Do.
Do	Lipa Extension	7,000.00		Pumping.
Bohol	Baclayon [a]	33,000.00	1,500	Gravity.
Do	Calape Extension [a]	33,000.00	700	Do.
Do	Carmen	6,100.00	600	Do.
Do	Clarin [a]	24,000.00	1,000	Do.

[a] Projects for which design and estimate were made in 1927.

TABLE C.—*Waterworks projects under consideration*—Continued

Province	Municipality	Estimated cost	Population to be served	System
Bohol	Corella	₱6,000.00	1,000	Gravity.
Do	Dimiao	37,000.00	2,000	Do.
Do	Garcia-Hernandez	31,500.00	2,000	Do.
Do	Guindulman	21,000.00	2,000	Do.
Do	Inabanga Extension [a]	19,000.00	1,000	Do.
Do	Lila	6,000.00	700	Do.
Do	Loay Extension	3,200.00	500	Do.
Do	Maribojoc [a]	84,000.00	4,000	Do.
Do	Valencia	24,000.00	2,000	Do.
Bukidnon	Impasugong	36,000.00	1,600	Do.
Bulacan	Baliuag	120,000.00	8,000	Pumping.
Do	Hagonoy [a]	80,000.00	9,000	Do.
Do	Malolos Extension	5,000.00	1,100	Do.
Do	Meycauayan [a]	75,000.00	5,500	Do.
Do	Obando	75,000.00	5,000	Do.
Do	Pulilan	18,000.00	3,000	Gravity.
Do	San Ildefonso	45,000.00	2,500	Pumping.
Do	Santa Maria [a]	40,000.00	3,000	Do.
Cagayan	Aparri	346,000.00	9,200	Do.
	Camalaniugan		2,350	Do.
	Lallo	70,000.00	1,400	Do.
Camarines Sur	Iriga		10,000	Do.
Do	Camaligan	300,000.00	1,500	Gravity.
Do	Canaman		1,500	Do.
Do	Magarao		4,000	Do.
Do	Naga		7,000	Do.
Do	Pasacao	5,100.00	1,000	Do.
Capiz	Capiz-Ivisan [a]	186,000.00	8,000	Do.
Do	Dumalag [a]	60,000.00	5,000	Do.
Cavite	Dasmariñas	31,000.00	5,000	Do.
Cebu	Asturias	27,000.00	1,100	Pumping.
Do	Argao	39,000.00	4,500	Gravity.
Do	Badian	30,000.00	1,700	Do.
Do	Bantayan	20,000.00	4,000	Pumping.
Do	Barili Extension	8,600.00	300	Gravity.
Do	Barrio Malones [a]	25,000.00	1,600	Do.
Do	Cebu Extension Lahug.	48,000.00	1,000	Do.
Do	Cebu Extension Pardo. [a]	41,000.00	....	Gravity.
Do	Dumanjug Improvement.	32,000.00	3,200	Do.
Do	Mandaue	35,000.00	2,500	Do.
Do	Minglanilla	12,000.00	1,500	Do.
Do	Oslob	15,000.00	2,000	Do.
Do	Bonda	30,000.00	1,900	Do.
Do	San Francisco Improvement.	27,000.00	....	Do.
Do	Talisay	30,000.00	2,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Pumping.
Ilocos Sur	Barrio Pandan [a]	9,000.00	700	Gravity.
Do	Magsingal [a]	63,000.00	4,000	Do.
Do	Santiago [a]	18,000.00	1,300	Do.
Iloilo	Ajuy	8,000.00	1,100	Do.
Do	Sara [a]	42,000.00	2,000	Do.
Laguna	Lilio Extension	₱27,500.00	2,500	Gravity.
Do	Los Baños [a]	45,000.00	6,000	Do.
Do	Lumban [a]	22,000.00	4,300	Do.
Do	Pila	60,000.00	2,200	Pumping.
Lanao	Iligan [a]	42,000.00	4,000	Gravity.
La Union	Agoo [a]	24,000.00	1,500	Do.
Do	Naguilian [a]	39,000.00	2,500	Do.
Leyte	Maasin	30,000.00	3,300	Do.
Do	Merida [a]	10,500.00	1,000	Do.
Do	Villaba	9,000.00	1,700	Do.
Masbate	San Fernando	21,000.00	2,500	Do.
Marinduque	Boac Capitol Building. [a]	6,500.00	500	Pumping.
Misamis	Jasaan	20,000.00	2,500	Gravity.
Do	Jimenez	30,000.00	4,000	Do.
Do	Misamis	66,000.00	3,450	Pumping.
Do	Salay [a]	15,000.00	2,000	Gravity.
Occidental Negros	Barrio Toboso [a]	18,000.00	800	Do.
Do	Silay	461,000.00	6,000	Do.
Do	Sumag		1,300	Do.
Do	Talisay		6,000	Do.
Do	Calatrava	37,500.00	1,500	Do.
Do	Murcia [a]	45,000.00	1,500	Do.
Do	Pinacutan	2,300.00	....	Do.
Oriental Negros	Ayungon [a]	21,000.00	1,000	Do.
Do	Barrio Bolos [a]	9,000.00	1,100	Do.
Do	Luzuriaga Extension	8,500.00	650	Do.
Do	Manhuyod	12,000.00	2,000	Do.
Do	San Juan	21,000.00	2,000	Do.
Do	Tanjay	42,000.00	3,000	Do.
Palawan	Concepcion	3,600.00	600	Do.
Do	Coron Improvement	13,000.00	600	Do.
Pampanga	Angeles	80,000.00	8,000	Do.
Do	Guagua [a]	75,000.00	6,000	Pumping.
Do	San Fernando [a]	90,000.00	5,000	Do.
Pangasinan	Malasaqui	30,000.00	2,600	Do.
Do	Urdaneta	1,800.00	....	Gravity.
Rizal	Pasig Extension	27,000.00	5,200	Pumping.
Do	Insular Asylum, San Felipe Neri. [a]	20,000.00	1,200	Do.
Romblon	Badajoz [a]	24,000.00	1,500	Gravity.
Do	Cajidiocan [a]	12,000.00	1,000	Do.
Samar	Llorente	14,000.00	2,500	Pumping.
Do	Oras Improvement	10,000.00	3,500	Gravity.
Sorsogon	Barcelona	25,500.00	4,000	Do.
Do	Casiguran	70,000.00	5,000	Do.
Surigao	Surigao	48,000.00	4,000	Do.
Tarlac	Tarlac	135,000.00	6,000	Pumping.
Do	Tarlac Extension [a]	4,000.00	1,000	Do.
Tayabas	Atimonan	117,000.00	6,000	Gravity.
Do	Polillo [a]	12,000.00	1,000	Do.
Do	Tayabas Extension	20,000.00	1,200	Do.
Total	....	5,539,200.00	346,100	....

[a] Projects for which design and estimate were made in 1927.

[a] Projects for which design and estimate were made in 1927.

APPENDIX

ACTIVE PROJECTS, JANUARY 1, 1928

Provinces	Roads and trails			Bridges and culverts			Provincial capitols			Presidencias		Prisons			Schools		Markets and tiendas		Hospitals			Miscellaneous buildings			Water systems			Electric light plants			Artesian wells			Port works			Miscellaneous projects						Total
	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Wireless stations	Surveys and investigations	Irrigation systems	River control	Monuments	Unclassified	
Abra	4														6								1																				11
Agusan	4																		1												1			1				1					8
Albay	7	1	1	1											2				1						1						1							1				1	17
Antique	4										2				2				1						1									1									11
Bataan	2	3			1			1							1																							2	1				11
Batangas	11		1			1	1				1				1		1								2		1	1						1								2	24
Benguet	2	1		1						1					1		1								1			2													1	17	28
Bohol	6									1					2		1					3	1											2								1	17
Bukidnon	2	2	1												1																												6
Bulacan	6	2	3							1						1						1	3		4						1							2					24
Cagayan	5	2													3		2					1			1									1	1			1				2	19
Camarines Norte	4	1							1								1															2										1	10
Camarines Sur	9	3						2							2	1	1			1												20						1					40
Capiz	3	2													2							2			1													1					11
Cavite	11	6	1	2											8																							5	1			2	36
Cebu	3	2	1				1			1					8		1		1			1	1		4	2									1							2	29
Cotabato	4						1											1					1		1		1											1					10
Davao	5	3		1			1				1				4				4				5		1									4							1	2	32
Ilocos Norte	13	3		1			1			2					2		1		2				1		1									1								3	31
Ilocos Sur	3	1		1											4								1		5													1		1			17
Iloilo	10		1																						2															1		3	17
Isabela	5	2								1					5	2																						1					16
Laguna	5		2	1											4							1			2																		15
Lanao	3														1								1																				5
La Union	6	15													6	3						1			2			1										4					38
Leyte	5	2								2															1										1			2		2		3	18
Manila															1				4				48												4							8	65
Marinduque	2						1																		1																		4
Masbate	3	2		1											1										1			1			1	1						1					12
Mindoro	3	2		1		1				1					3	1	1																					1					14
Misamis	7	5	1					1		2	1				9		1		1	2		1			1													1			3	1	37
Mountain Province		7								1										1			2			2																	13
Nueva Ecija	14	4								2		1			4	1	3					5	1		2													12	1		1	4	55
Nueva Vizcaya	2	4													1	1						1	1																				10
Occidental Negros	11			2			1			2					4		1		4			4												1								2	32
Oriental Negros	4	3													4										2									2	3			1				1	20
Palawan	2	1													5	2			1			1	1																			1	14
Pampanga	3	3		1						1					2										1													1		2			14
Pangasinan	10		1	2						1					6	2	1								1			1											1			1	27
Rizal	11	1		2													1					1			1													1			2	2	22
Romblon	3	1													5																							2					11
Samar	9														3							1	1												1								15
Sorsogon	6	1								1	1				3		2								1									1	1			1					18
Sulu	13	2	3												1								2												1				1			1	24
Surigao	3	2													6								2								1				2			1					17
Tarlac	4	1		1						1					1																											1	9
Tayabas	9	1						1		2					4								3		4									3	1			1	1	1		2	33
Zambales	6														4								2		1							1											14
Zamboanga	4	1																				2	2		2										1								12
Total	271	92	16	18	1	2	7	5	1	23	6	1	0	0	132	14	19	1	20	4	0	26	80	0	48	4	2	6	0	0	5	24	0	18	17	0	0	46	6	7	8	63	993

NOTE.—Under the heading "Unclassified" are included projects not embraced by any of the above classifications, such as telephone lines, parks, grounds, fences for schools, swimming pools, etc.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1928]

A. D. WILLIAMS, *Director of Public Works*
MARCIAL KASILAG, *Chief Constructing Engineer*
J. C. COOKINGHAM, *Acting Chief Designing Engineer*
NICANOR CORTES, *Chief Irrigation Engineer*
C. MANDELBAUM, *Acting Chief, Division of Architecture*
R. REINOSO, *Chief, Administrative Division*

CENTRAL OFFICE ORGANIZATION

ADMINISTRATIVE DIVISION

Ramon Roque, Assistant Accountant.
Francisco Cruz, Chief Clerk.
Teodoro Camu, Cashier and Disbursing Officer.
Primo Villar, Law Clerk.
Filomeno Sta. Ana, Record Clerk.
Jose de Jesus, Property Clerk.
Salustiano Reyes, Superintendent of Automobiles.

DESIGNING DIVISION

L. L. Vincent, Supervising E. and M. E.
Juan Piedad, C. E.
Domingo Guanio, C. E.
Eliodoro Segui, C. E.
Ross Hagler, Principal Engineering Aid.
Manuel I. Felizardo, E. and M. E. (pensionado in U. S.).
Venancio A. Gloria, C. E.
Alejandro J. Villanueva, C. E.
Ciriaco Coronel, E. and M. E.
Anastasio Pasos, M. E.
Cosme Ventura, Asst. E. E.
Vicente Villanueva, Asst. E. E.
Pablo Ilagan, Asst. E. E.
Feliciano Palma, Structural Draftsman.
Arsenio P. Luna, Asst. Civil Engineer.
Marcos Amponin, Asst. M. E.
Amando Mirasol, Asst. M. E.
Domingo de la Paz, Asst. Civil Engineer.
Eugenio Ylo, Asst. Civil Engineer.
Francisco Santana, Asst. Civil Engineer.
Juan T. Villanueva, Asst. M. E.

DIVISION OF ARCHITECTURE

Juan M. Arellano, Supervising Architect (pensionado in U. S.)
Tomas Mapúa, Supervising Architect.
Antonio Toledo, Acting Supervising Architect.

DIVISION OF ARCHITECTURE—Cont.

Antonio M. Tayzon, Civil Engineer.
Teodato P. Macabulos, Civil Engineer.
Gonzalo T. Vales, Civil Engineer.
Sancho B. de Leon, Civil Engineer.
Juan O. Altiveros, Architect.
V. Fernandez Lavadia, Civil Engineer.
Antonio Fernandez de Castro, Assistant Civil Engineer.
Antonio M. Paterno, Assistant Civil Engineer.

CONSTRUCTING DIVISION

E. D. Smith, Division Enginner, First Division.
(Vacant) Division Engineer, Second Division.
Luis Francisco, Division Engineer, Third Division.
Vicente Fragante, Division Engineer, Fourth Division.
Valeriano Segura, Division Engineer, Fifth Division.
Fidel V. Larracas, Division Engineer.
Mamerto Cruz, Highway Engineer.
A. T. Sylvester, C. E. Constructing Engineer.
Gregorio Alcantara, C. E.
Jose Wright, C. E., Superintendent, Maintenance, Alteration and Repair.
Jose G. Licuanan, Asst. C. E.
H. Franco, Chief Electrician.
V. Castillo, Superintendent of Dredges.
F. W. McCaw, Supt. of Artesian Wells.

IRRIGATION DIVISION

W. J. Lamon, Project Engineer.
H. O. Bauman, Project Engineer.
Hilario S. Clemente, Designing Engineer.
Gonzalo Garcia, Project Engineer.

IRRIGATION DIVISION—Cont.

Graciano J. Militante, Project Engineer.
Manuel Gonzales, Civil Engineer.
Gregorio de Leon, Civil Engineer.
Deogracias de la Paz, Civil Engineer.
Julian A. Buendia, Civil Engineer (pensionado).
Crisostomo Almajose, Civil Engineer.
Jose O. Lahoz, Civil Engineer.
Vicente R. Cruz, Civil Engineer.
Felipe R. Jimenez, Civil Engineer.
Bartolome Puzon, Civil Engineer.
Alfredo G. Eugenio, Supt. of Irrigation.
Faustino Salvador, Supt. of Irrigation.
Fernando Arnaldo, Supt. of Irrigation.
Ramon C. Caluya, Supt. of Irrigation.
Procopio Eleazar, Assistant Civil Engineer (pensionado).
Agapito Alano, Assistant Civil Engineer.
Eleuterio Macalalag, Assistant Civil Engineer.
Antonio A. Villanueva, Assistant Civil Engineer.
Servando Suguitan, Assistant Civil Engineer.
Nicolas R. Jimenez, Assistant Civil Engineer.
Albert L. Morrow, Assistant Civil Engineer.
Filemon Rodriguez, Assistant Civil Engineer.
Filemon Zablan, Assistant Civil Engineer.
Jacinto Gochoco, Chief Hydrographer.
Wilfred Demers, Supervising Hydrographer.
Arturo Pancho, Hydrographer.
Roberto P. Villatuya, Hydrographer.
Antonio Baldonado, District Hydrographer.
Manuel V. Trani, Assistant Hydrographer.
Tomas T. Zita, Assistant Hydrographer.
Lorenzo Ylarde, Assistant Hydrographer.
Artemio Abaya, Chief Water Rights Inspector.
Mariano N. Leones, Supervising Surveyor.
Eliseo M. Panopio, Surveyor.
Hilarion S. Silayan, Agriculturist.

DISTRICT ORGANIZATION

E. J. Halsema, D. E., Baguio, Benguet.
Irineo M. Santos, C. E., Baguio, Benguet.
Aurelio N. Cobangbang, C. E., Baguio, Benguet.
E. D. Smith, Division Engineer, Manila.
Leon Ines, D. E., Ilocos Norte.
Deogracia L. Pablo, Asst. C. E., Ilocos Norte.
Jose S. Alejandrino, Asst. C. E., Ilocos Norte.
Vicent Maria Abaya, Asst. C. E., Ilocos Norte.
Ricardo Nostratis, D. E., Ilocos Sur-Abra.
Carlos de Leon, Asst. C. E., Ilocos Sur.
Felino Brillantes, Asst. C. E., Abra.
Gaudioso Cruel, D. E., La Union.
Zacarias Sadueste, Asst. C. E., La Union.
Mariano Flores, Asst. C. E., La Union.
Roque Peredo, Acting D. E., Mt. Province.
Hermenegildo Carpio, Asst. C. E., Mt. Province.
Manuel Diaz, Acting D. E., Cagayan-Batanes.
Bernabe V. Gregorio, C. E., Cagayan.
Manuel Feliciano, Asst. C. E., Cagayan.
Martin Pulido, Asst. C. E., Cagayan
Vicente B. Oledan, Acting D. E., Nueva Vizcaya.
Jose Tomacruz, Asst. C. E., Nueva Vizcaya.
Jaime Laguardia, Acting D. E., Isabela.
Catalino Guillermo, Asst. C. E., Isabela.
Nicolas L. Cuenca, D. E., Zambales.
Simeon Alfonso, Asst. C. E., Zambales.
Vicente Orosa, Acting D. E., Nueva Ecija.
Eladio M. Santos, C. E., Nueva Ecija.
Tomas Lorenzo, Asst. C. E., Nueva Ecija.
Antonio J. Zarate, Asst. C. E., Nueva Ecija.
Rosalio Villalon, D. E., Tarlac.
Lorenzo Samonte, Asst. C. E., Tarlac.
R. M. Contreras, Asst. C. E., Tarlac.
Arturo P. Nitorreda, D. E., Pangasinan.
Marcial T. Lagunzad, Asst. C. E., Pangasinan.
Eduardo de los Santos, Asst. C. E., Pangasinan.
Bonifacio Villanueva, Surveyor.
Luis Francisco, Division Engineer, Manila.
Isaias Fernando, D. E., Batangas.
Miguel Y. Garcia, C. E., Batangas.
Miguel P. Taña, Asst. C. E., Batangas.
Abelardo Icasiano, Acting D. E., Laguna.
Gregorio Matanguihan, Asst. C. E., Laguna.
Agapito C. Tuason, Asst. M. E., Laguna.
Jose V. Bagtas, D. E., Tayabas.
Antonio A. Fajardo, Asst. C. E., Tayabas.
Santiago C. Magbuhat, Asst. C. E., Tayabas.
Alfonso Ungson, Asst. C. E., Tayabas.
Fil de Peralta, Asst. C. E., Tayabas.
Vicente Purugganan, Asst. C. E., Spl. Duty, Tayabas.
Florentino Pontiveros, Asst. C. E., Spl. Duty, Tayabas.
Segundo C. Gloria, Asst. C. E., Spl. Duty. Tayabas.
Esteban Manzanero, Asst. C. E., Spl. Duty, Tayabas.
Antonio Ignacio, Asst. C. E., Spl. Duty, Tayabas.
Gregorio E. Imperial, D. E., Mindoro.
Martin M. Resplandor, Jr. C. E., Mindoro.
Alfredo V. Martinez, Acting D. E., Cam. Norte.
Fedil S. Manio, Asst. C. E., Camarines Norte.
Edilberto Evidente, Asst. C. E., Spl. Duty Cam. Norte.
Antonio R. Soriano, Asst. C. E., Spl. Duty, Cam. Norte.
Jose H. Pañganiban, Asst. C. E., Spl. Duty, Cam. Norte.
Homobono H. Gonzalez, D. E., Camarines Sur.
Dominador Ermitaño, Asst. C. E., Cam. Sur.
Carlos Leaño, Asst. C. E., Camarines Sur.
Pedro Lorenzo, Surveyor, Camarines Sur.
Dalmacio Urtula, D. E., Albay.
Francisco Katigbak, C. E., Albay.
Arturo M. Gonzalez, Asst. C. E., Albay.
Ramon Madrigal, Asst. C. E., Albay.
Sergio Bayan, Acting D. E., Sorsogon.
Jose Morelos, Asst. C. E., Sorsogon.
Francisco Alvarez, Acting D. E., Rizal.
Jose Preysler, Asst. C. E., Rizal.
B. T. Saldaña, Asst. C. E., Rizal.
Arsenio V. Caluya, Jr. C. E., Rizal.
Rafael Ungson, Acting D. E., Cavite.
Pio Mendoza, Asst. C. E., Cavite.
Jesus Cordero, Asst. C. E., Cavite.
Fernando E. V. Sison, Acting D. E., Bataan.
Jose Cruz, Asst. C. E., Bataan.
Saturnino Lopez, D. E., Bulacan.
Dominador M. Cruz, Asst. C. E., Bulacan.
Alejandro G. Paraiso, Asst. C. E., Bulacan.
Isabelo Lagniton, D. E., Pampanga.
Luis Novenario, Asst. C. E., Pampanga.
M. Mario Bundalian, Asst. C. E., Pampanga.
Vicente Fragante, Div. E., Manila.
Emilio Buenaventura, Acting D. E., Marinduque.
Alejo Aquino, D. E., Iloilo.
Jose Virtucio, Asst. C. E., Iloilo.
Galo C. Castronuevo, Asst. C. E., Iloilo.
Carlos Salcedo, Asst. C. E., Iloilo.
Silvestre Tan Chauco, Acting D. E., Capiz.
Florentino Segovia, Asst. C. E., Capiz.
Carlos Amoranto, Asst. C. E., Capiz.
Hospicio I. Fernandez, D. E., Antique.
Filomeno Piczon, Acting D. E., Romblon.
Severino Fernandez, D. E., Occ. Negros.
Jose Gandionco. Asst. C. E., Occ. Negros.
H. E. Fernandez, Asst. C. E., Occ. Negros.
Angel Pascual, Asst. C. E., Occ. Negros.
Catalino Paraiso, Asst. C. E., Occi. Negros.
Ambrosio Osmeña, Acting D. E. Ori. Negros.
Juan G. Paraiso, Asst. C. E., Oriental Negros.
Antonio Piñero, Asst. C. E., Oriental Negros.
Jose Lozada, D. E., Zamboanga.
Manuel T. Tubungbanua, Asst. C. E., Zamboanga.
Pedro Olympia, Asst. C. E., Zamboanga.
Rufino Garcia, Acting D. E., Cotabato.
Severino D. Pineda, Asst. C. E., Cotabato.
Leandro Espejo, Asst. C. E., Cotabato.
Bernardino Guerrero, Asst. C. E., Sp. duty, Cotabato.
Andres Villegas, Asst. C. E., Sp. duty, Cotabato.
Alfonso Oboza, Acting D. E., Davao.
Jose Viacrucis, Asst. C. E., Davao.
Rodolfo Maslog, Asst. C. E., Sp. Duty, Davao.
Mariano Lacandola, Asst. C. E., Sp. Duty,
Luis M. Sirilan, Asst. C. E., Sp. Duty, Davao.
W. J. Hollis, Acting D. E., Sulu.
Valeriano Segura, Div. E., Manila.
H. C. Garretson, D. E., Cebu.
Francisco Fabros, Asst. C. E., Cebu.
Antonio Aseniero, Asst. C. E., Cebu.
Jose Chavarria, Asst. C. E., Cebu.
Jose Follosco, Acting D. E., Bohol.
Julio A. Reyes, Asst. C. E., Bohol.
Carlos Cuevas, Asst. C. E., Bohol.
Roy N. Allen, Acting D. E., Leyte.
Pedro M. Lladoc, Asst. C. E., Leyte.
Joaquin L. Panis, Asst. C. E., Leyte.
Pastor Avisado, Acting D. E., Samar.
Liborio Urtizberia, Asst. C. E., Samar.
Focas Zulueta, Asst. C. E. Sp. Duty, Samar.
Conrado Gomez, Asst .C. E., Sp. Duty, Samar.
Bonifacio Eusebio, Asst. C. E., Sp. Duty,
Ciriaco P. Rama, Surveyor, Samar.
Jose Ignacio, Acting D. E., Masbate.
Gil R. Mallare, Acting D. E., Palawan.
Pedro Formilleza, Acting. D. E., Surigao.
Rufino Pimentel, Asst. C. E., Surigao.
Marcelo Operario, Jr. C. E., Surigao.
Mariano D. Rico, Acting D. E., Agusan.
Alejandro Rivera, D. E., Lanao.
Teodoro E. Mocorro, Asst. C. E., Lanao.
Lorenzo Ortiz, Acting D. E., Misamis.
Dionisio Escobar, Asst. C. E., Misamis.
Bonifacio Salas, Asst. C. E., Misamis.

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THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS • PHILIPPINE ISLANDS •

NOV 13 1929

BULLETIN

Vol. 17 JANUARY 1, 1929 No. 1

CONCRETE SECTION, MANILA-TARLAC ROAD, PAMPANGA PROVINCE

246451

CONVERSION TABLE

One peso (₱) = **50 cents, U. S. currency.**

One kilometer (km.) = **0.62 mile.**

One kilogram (kg.) = **2.20 pounds (lbs.).**

One centimeter (cm.) = **0.39 inch.**

One meter (m.) = **3.28 feet.**

One hectare = **2.47 acres.**

One cubic meter (cu. m.) = **1.31 cubic yards.**

One hectare meter per day = **8.107 acre feet per day.**

One liter per second (second liter) = **0.0353 cubic feet per second (cu. sec.) second feet.**

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1928

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, *March 18, 1929*

SIR:

I have the honor to submit herewith the Annual Report of the Bureau of Public Works for the year ending December 31, 1928.

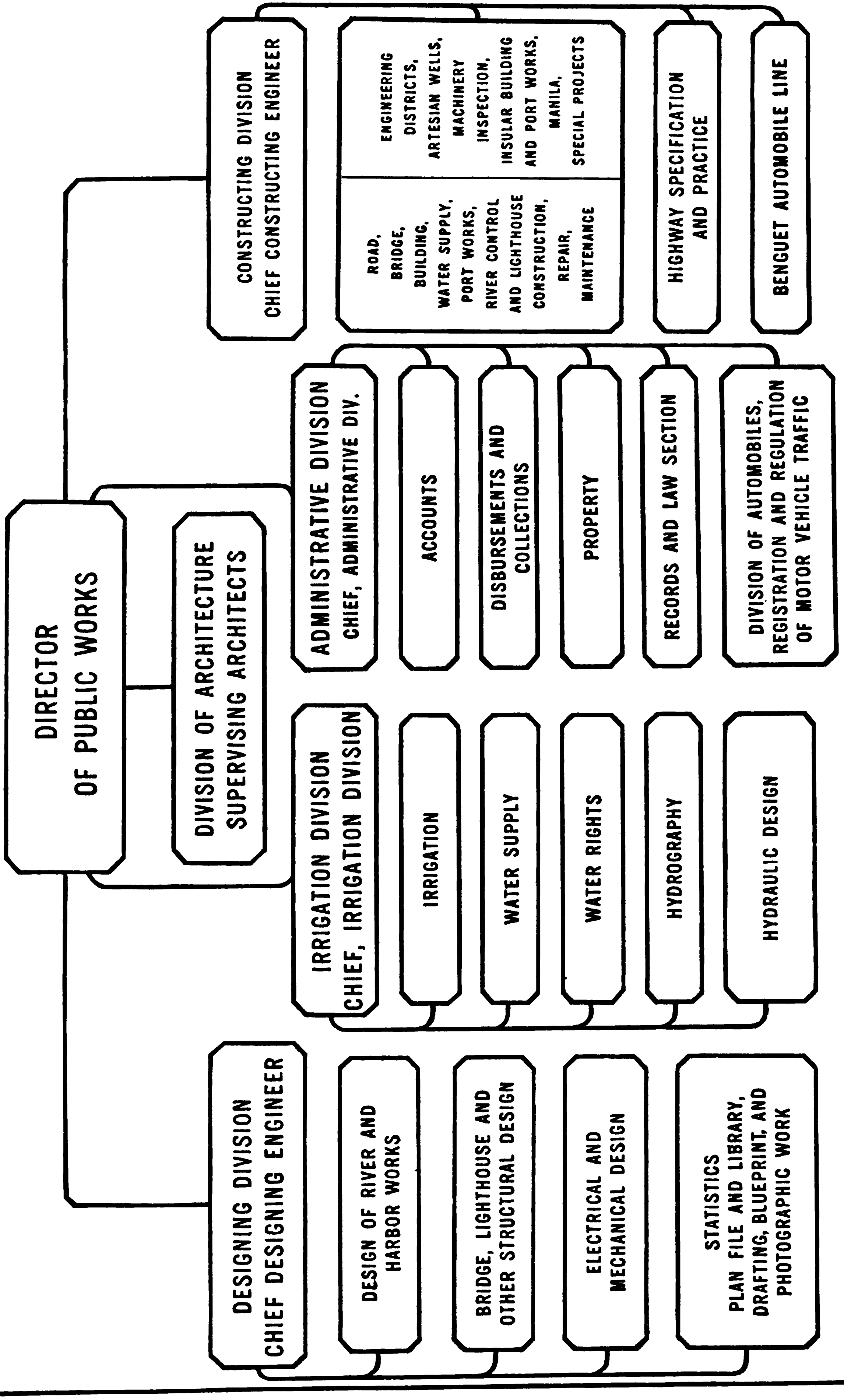
Very respectfully,

A. D. Williams
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1928


DIRECTOR OF PUBLIC WORKS
DIVISION OF ARCHITECTURE SUPERVISING ARCHITECTS
CONSTRUCTING DIVISION CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE
ADMINISTRATIVE DIVISION CHIEF, ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS AND LAW SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
IRRIGATION DIVISION CHIEF, IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
DESIGNING DIVISION CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
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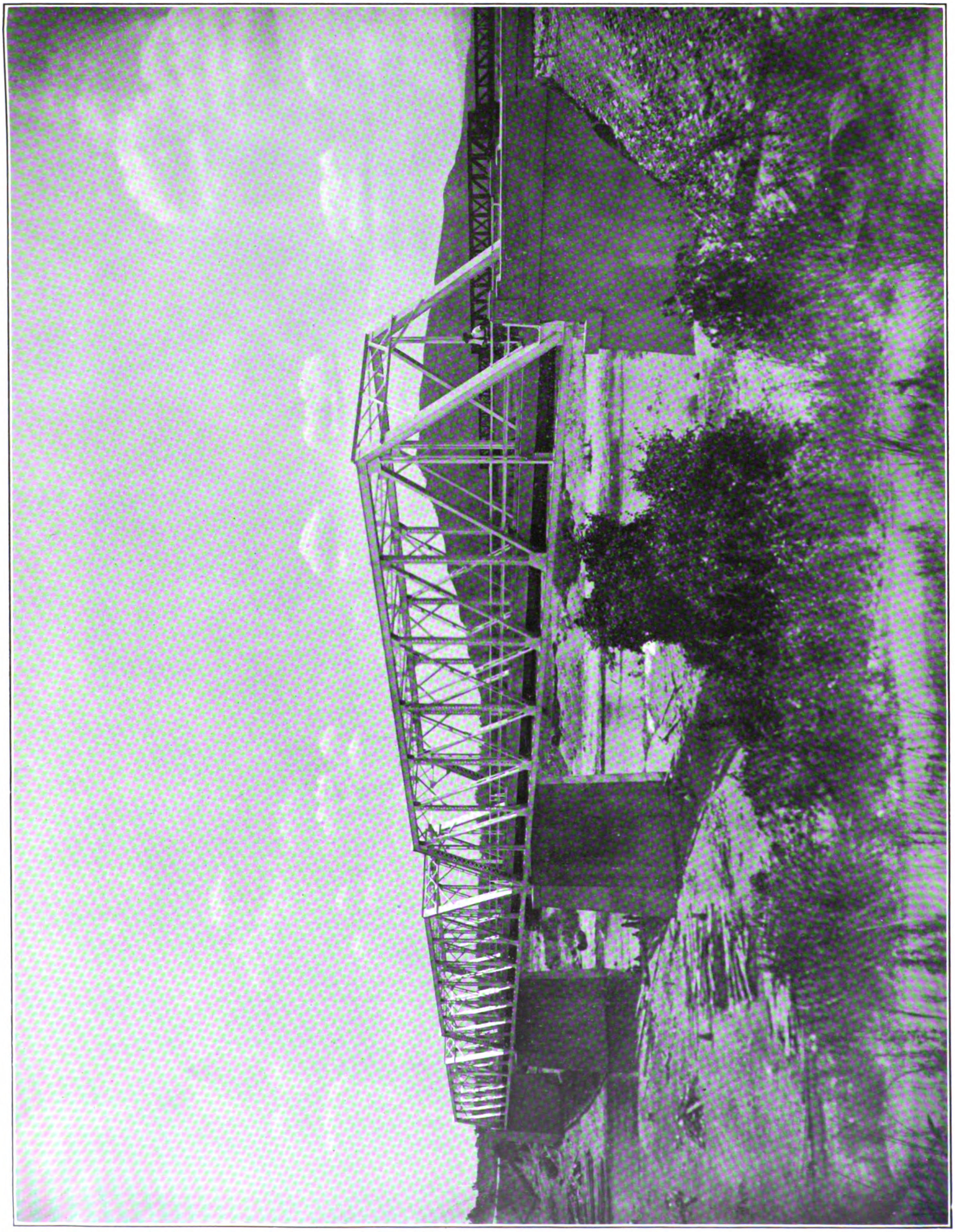


PARUA BRIDGE, TARLAC

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and principal functions of the Bureau of Public Works are shown in the organization diagram on page four. The Philippine Islands are now divided into forty-seven (47) engineering districts which, with the exception of a separate district for the City of Manila, are coextensive with provincial limits. The district engineer is the local representative of the Bureau in each district and is responsible for all activities, excepting the larger irrigation projects which are constructed by project engineers under the direct supervision of the Manila Office. The Central Office in Manila prepares plans and specifications for construction projects and exercises general supervision over all activities of the Bureau.

PERSONNEL

Number of employees paid direct from Bureau and project funds as of December 31, 1928: Americans, 14; Filipinos, 540.

[NOTE.—The corresponding figures for December 31, 1927, are: Americans, 18; Filipinos, 362, respectively.]

Number of technical employees as of December 31, 1928: Americans, 9; Filipinos, 217.

[NOTE.—The corresponding figures for December 31, 1927, are 10 and 210, respectively.]

American Technical Employees

Position	Permanent	Temporary	Total
Civil engineer	6	0	6
Electrical and mechanical engineer	1	0	1
Surveyor	1	0	1
Architect	1	0	1
Total	9	0	9

Filipino Technical Employees

Position	Permanent	Temporary	Total
Civil engineer	50	18	68
Assistant civil engineer	108	15	123
Junior civil engineer	1	0	1
Electrical engineer	2	0	2
Mechanical engineer	2	0	2
Mechanical and electrical engineer	2	0	2
Assistant mechanical engineer	4	1	5
Assistant electrical engineer	2	0	2
Junior electrical engineer	0	1	1
Surveyor	6	0	6
Junior surveyor	1	0	1
Supervising architect	1	0	1
Agriculturist	1	0	1
Architect	2	0	2
Total	182	35	217

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment and engaged upon work supervised by the Bureau by whatever branch of the Government paid:

Changes	Americans	Filipinos	Total 1928	Total 1927
Number of appointments	0	236	236	186
Number of transfers to the Bureau	0	21	21	3
Number of separations for cause	0	10	10	6
Number of voluntary resignations	0	104	104	89
Number of transfers from the Bureau	0	28	28	7
Number of retirement	1	1	2	2
Number of separations due to expiration of employment	0	1	1	2
Number of deaths	0	6	6	8

NOTE.—Item "Number of appointments" includes new and probational appointments.

The activities of the Bureau during 1928 were materially increased on account of the amount of increased appropriations provided for public works. The results obtained during the year are set forth in detail in the following report and tabulations:

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1927 AND 1928

Items	Insular expenditures				Provincial and municipal expenditures		Fund from private sources		Total	
	Bureau of Public Works		Appropriations controlled by other Bureaus							
	1927	1928	1927	1928	1927	1928	1927	1928	1927	1928
	Pesos	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*
Roads and bridges	124,304.86	125,204.91	38,455.14	90,313.91	11,912,539.80	13,667,576.60		1,287.85	12,075,299.80	13,884,383.27
Telegraph, telephone and cable lines	325,501.87	526,000.00			28,770.96	31,647.18			354,272.83	557,647.18
Buildings	946,384.13	3,171,317.29	23,590.16	52,859.19	3,798,613.35	3,010,956.96			4,768,587.64	6.235,133.44
Wireless station buildings including towers and masts	33,910.70	35,446.58	1,575.73						35,486.43	35,446.58
Maintenance, alteration and repair of public buildings	455,531.89	436,959.64	815.62	136.10	168,176.40	130,764.23			624,523.91	567,859.97
River and harbor works (including lighthouses, buoys, and beacons)	2,081,060.68	2,667,865.76	919,028.47	144,645.53	116,699.60	33,861.30	20,436.91	318.93	3,137,225.66	2,846,691.52
Artesian wells and water supply	293,304.51	238,019.59	6,436.59	7,683.89	1,512,963.59	1,440,810.74	11,324.51	14,261.16	1,824,029.20	1,700,775.38
Irrigation projects	126,283.97	119,867.00	1,590,190.84	1,712,479.03	1,713.69	3.24	167,832.68	214,574.12	1,886.021.18	2,046,923.39
Benguet automobile line	130,380.23	185,410.12							130,380.23	185,410.12
Registration and regulation of motor vehicle traffic	83,040.00	103,040.00							83,040.00	103,040.00
Los Baños quarry	140,000.00	140,000.00							140,000.00	140,000.00
Board of examiners for engineers and architects	3,800.00	3,800.00							3,800.00	3,800.00
Regulation, safeguarding of traffic and collection of tolls on Kennon and Naguilian Roads	12,000.00	13,500.00							12,000.00	13.500.00
Dwellings and equipment for rent in Baguio	37,664.51	44,720.00							37,664.51	44,720.00
Miscellaneous			169,090.46	240,886.45	344,104.80	315,025.32	3,473.80	4,519.78	516,669.06	560,431.55
Totals	4,793,167.35	7,811.150.89	2,749.183.01	2,249.004.10	17,883,582.19	18,630,645.57	203,067.90	234,961.84	25,629,000.45	28,925,762.40

BALANCE SHEET, BUREAU OF PUBLIC WORKS

Assets	1927	1928	Liabilities	1927	1928
CURRENT:			CURRENT:		
Cash, collecting and disbursing officer	₱2,029,463.73	₱2,275,095.69	Accounts payable	₱2,008,935.86	₱4,416,670.22
Cash (deposit), Insular Treasury	317,500.05	1,900,842.99	Accrued leave payable	211,935.81	217,802.92
Accounts receivable	2,789,696.15	2,068,956.34	Undistributed collections	47,937.03	67,122.64
Supplies and materials	497,378.37	515,583.40	Deferred credit to income	1,141.78	5,809.38
Prepayments	3,610.97	507.82	Fiduciary fund	[a] 44,060.39	
			Insurance reserve	27,937.33	1,667.87
INVESTMENT:					
Work in process	2,254.41	1,131.46	BALANCES OF APPROPRIATIONS:		
			Construction of buildings, etc	1,051,339.77	473,345.36
			Maintenance, alteration, and repair of public buildings	152,619.47	115,659.83
			Irrigation system	25,371.92	18,504.92
			Artesian wells and waterworks	102,098.51	66,078.92
			Harbor and river improvement	1,299,699.59	673,507.07
			Roads and bridges	11,121.79	14,416.88
Total current assets	5,639,903.68	6,757,117.70	Telephone, telegraph, cable, etc	526,000.00	613,500.00
			Lighthouse, buoys, and beacons	129,704.93	73,031.69
			Total current liabilities	5,639,909.68	6,757,117.70
FIXED PROPERTY:					
Real property and improvements	47,085,938.63	51,246,181.94			
Equipment	4,590,245.34	4,222,195.49	PRINCIPAL ACCOUNT SURPLUS:		
(Less depreciation)	(941,975.00)	(908,144.58)	Fixed property investment	50,734,208.97	54,562,232.85
Total assets	56,374,112.65	61,319,350.55	Total liabilities	56,374,112.65	61,319,350.35

[a] For corresponding figure for 1928, see balance sheet of fiduciary fund.

III—MOTOR VEHICLE SPECIAL FUND

Assets	1927	1928	Liabilities	1927	1928
CURRENT:			CURRENT:		
Cash, Insular Treasury	₱136,528.91	₱312,904.82	Accounts payable	₱30,214.06	₱53,827.89
Cash (collecting and disbursing officers)	7,319.98	3,287.79	Undistributed collections	371.35	571.98
Supplies and materials		109.90	Accrued leave payable	5,326.98	7,526.42
Accounts receivable	21.21	16.32	Deferred credits to income		186.87
Prepayments	3,103.15		Unappropriated surplus	111,060.86	254,205.67
Total current assets	146,973.25	316,318.83	Total current liabilities	146,973.25	316,318.83
FIXED PROPERTY:					
Equipment	12,112.25	21,438.07	Fixed property investment	12,112.25	19,780.77
Less depreciation		(1,657.30)			
Total assets	159,085.50	336,099.60	Total liabilities	159,085.50	336,099.60

IV—FIDUCIARY FUND

Assets	1927	1928	Liabilities	1927	1928
CURRENT:			CURRENT:		
Cash, Insular Treasury	₱44,050.39	₱26,385.57	Guarantee Fund	₱39,715.50	₱23,616.22
Cash (collecting and Disbursing Officer)	10.00		Civil Service Trust Fund	4,343.89	2,769.35
Total	44,060.39	26,385.57	Total	44,060.39	26,385.57

V—HIGHWAY SPECIAL FUND

Assets	1927	1928	Liabilities	1927	1928
Cash, Insular Treasury	₱1,060,826.16	₱196,790.29	Unappropriated Surplus	₱1,060,826.16	₱196,790.29

VI—BAGUIO DWELLINGS AND EQUIPMENT FOR RENT

Assets	1927	1928	Liabilities	1927	1928
CURRENT:			CURRENT:		
Cash, Insular Treasury	₱41,929.79	₱69,604.26	Deferred credits	₱2,197.14	₱616.34
Cash (collecting and disbursing officers)	10,343.85	2,881.39	Accounts payable	4,829.25	15,565.08
Accounts receivable	6,791.30	976.30	Undistributed collections	85.90	15.86
			Accrued leave payable	146.61	215.12
Total current assets	59,064.94	73,461.95	Unappropriated Surplus	51,807.04	57,049.05
FIXED PROPERTY:			Total current liabilities	59,064.94	73,461.93
Real property and improvement	627,185.92	627,185.92			
Equipment	132,496.40	141,496.40	PRINCIPAL ACCOUNTS SURPLUS:	708,249.38	716,485.94
Less depreciation	(51,432.94)	(52,196.38)	Fixed property investment	708,249.38	715,485.94
Total assets	767,314.32	789,947.89	Total liabilities	767,314.32	789,947.89

Interisland Shipping, Lower Pasig River, Manila

VII—BENGUET AUTOMOBILE LINE SPECIFIC FUND

Assets	1927	1928	Liabilities	1927	1928
CURRENT:			CURRENT:		
Cash, Insular Treasury	₱97,572.04	₱98,421.10	Accounts payable	₱21,335.44	₱31,267.84
Cash (collecting and disbursing officers)	7,264.70	7,715.04	Undistributed collections	172.85	146.75
Supplies and materials	66,214.96	85,928.25	Accrued leave payable	822.44	1,382.42
Accounts receivable	19,318.07	15,779.14	Unappropriated surplus	168,019.04	175,046.52
Total current assets	190,369.77	207,843.53	Total current liabilities	190,369.77	207,845.53
FIXED PROPERTY:			PRINCIPAL ACCOUNTS SURPLUS:		
Equipment	210,224.81	215,620.72	Fixed property investment	148,682.90	154,078.81
Less depreciation	(61,541.91)	(61,541.91)			
Total assets	339,052.67	361,922.34	Total liabilities	339,052.67	361,922.34

VIII—IRRIGATION INSURANCE FUND

Assets	1928	Liabilities	1928
CURRENT:		CURRENT:	
Cash, Insular Treasury	₱34,471.39	Unappropriated surplus	₱29,103.12
Cash (collecting and disbursing officers)		Undistributed collections	46,909.82
Accounts receivable	50,541.55	Tagudin Irrigation System	9,000.00
Total	85,012.94	Total	85,012.94

NOTE.—This Special Fund has been separated from General Fund as per instruction of the Bureau of Audits.

IX—MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS

Assets	1928	Liabilities	1928
CURRENT:		CURRENT:	
Cash (overdraft), Insular Treasury	(₱440,882.17)	Accounts payable	₱5,564.36
Cash (collecting and disbursing officers)	60,705.01	Accrued leave payable	1,012.77
Supplies and materials			
Accounts receivable	386,754.29		
FIXED ASSETS:		SURPLUS:	
Real property and improvements	337.37	Principal accounts surplus (fixed assets)	337.37
Total	6,914.50	Total	6,914.50

NOTE.—This Special Fund has been separated from General Fund in the year 1928 as per instruction of the Bureau of Audits.

STATEMENT OF APPROPRIATION OF INCOME AND EXPENSES (BUREAU OF PUBLIC WORKS PROPER)

Debit	1927	1928	Credit	1927	1928
Reversion of unexpended balances of administrative appropriation	₱20,103.77	₱28,719.67	Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharge collected)	₱942,270.00	₱955,270.00
Reversion of receipts	1,066,078.82	1,174,049.62	Receipts—prime cost	7,068,685.94	7,238,653.15
Operating expenditures offset by receipts	7,068,685.94	7,238,653.15	Receipts—surcharges	992,786.81	1,059,952.60
Expenditures, administrative appropriation	913,586.21	921,870.33	Receipts—miscellaneous	13,528.41	21,384.81
Outlays, purchase of equipment	8,580.00	4,680.00	Gain on supplies sold	1,068.08	1,123.24
			Inventory adjustments	2,252.42	32,792.85
			Income from rentals, equipment	16,967.77	30,200.21
			Sales of fixed assets	3,498.00	856.00
			Prior year's credit	35,957.33	27,739.91
Total debit	9,077,034.76	9,367.972.77	Total credit	9.077,034.76	9,367,972.77

OPERATION STATEMENT OF THE BUREAU OF PUBLIC WORKS (PROPER)

Operating revenue	1927	1928	Operating expenses	1927	1928
Rental	₱16,967.77	₱30,200.21	Supervising, technical, and clerical services (salaries)	₱750,170.11	₱758,580.55
Surcharges	992,786.81	1,059,952.60	Labor	50,488.86	46,454.50
Gain on goods sold	1,086.08	1,123.24	Consumption of supplies and materials	42,000.00	42,000.00
Inventory adjustments	2,252.42	32,792.85	Rental of building	22,666.65	19,999.93
Sales of fixed assets	3,498.00	849.00	Illumination and power service	8,000.00	9,000.00
Other service income	13,528.41	21,391.81	Traveling expenses of personnel	19,000.00	21,000.00
Prior year's credit	35,957.33	27,739.96	Repair service	5,000.00	5,000.00
			Postal, telegraph, telephone, and cable service	8,320.00	9,320.00
			Other expenses	7,940.79	7,300.00
			Total operating expenses	913,586.21	918,654.48
			Operating profit	152,492.61	255,395.19
Total	1,066,078.82	1,174,049.67	Total	1,066,078.82	1.174,049.67

SPECIAL APPROPRIATIONS

Name of activity	Appropriation		Expenditures		Reversion of appropriation		Income	
	Act 3340	Act 3555						
	1927	1928	1927	1928	1927	1928	1927	1928
1. Registration and regulation of motor vehicles	₱63,040.00	₱103,040.00	₱83,040.00	₱103,040.00			₱1,145,369.34	₱1,254,684.81
2. Regulation and safeguarding of traffic and collection of tolls	12,000.00	13,500.00	12,000.00	13,500.00			41,220.75	45,835.75
3. Benguet automobile line	163,343.00	165,410.12	130,300.23	185,410.12	₱ 32,962.77		175,250.53	192,457.60
4. Los Baños quarry	140,000.00	140,000.00	140,000.00	140,000.00			46,788.90	103,312.47
5. Board of Examiners for Engineers and Architects	3,800.00	3,800.00	3,800.00	3,800.00			2,460.00	2,810.00
6. Baguio dwellings and equipment for rent	40,915.00	44,720.00	37,664.51	44,720.00	3,250.49		48,487.38	49,962.01
Totals	445,098.00	490,470.12	406,864.74	490,470.12	36,213.26		1,459,576.90	1,649,042.64

TRANSACTION AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) FROM JANUARY 1 TO DECEMBER 31, 1928

GENERAL FUND

	1927	1928		1927	1928
3 Interbureau transfers	₱1,365,635.72	₱210,688.12	Principal account surplus from previous year	₱48,678,909.30	₱49,865,164.44
7 Sales	3,497.86	853.90	1 Purchase	79,394.92	80,841.49
8 Losses (covered by affidavits)		1,649.61	2 Construction	2,257,917.80	4,022,791.76
9 Depreciation accruals (including assets dropped on Inventory and Inspection Reports)	184,812.37	297.48	3 Interbureau transfers	580,881.50	1,832.00
9-1 Depreciation on ordinary equipment		25,421.75	4 Found at station	33,443.98	4,037.47
9-2 Depreciation on artesian wells equipment		47,860.19	11 Inventory adjustment	66.37	
9-3 Depreciation on automobiles and steam wagons		19,974.35			
10 Transfers to provinces and municipalities	211,503.48	1,500.00			
Principal account surplus	49,865,164.44	54,566,421.76			
	51,630,613.87	54,874,667.16		51,630,613.87	54.874.667.17

SPECIAL FUND

III—*Motor vehicle special fund*

9-1 Depreciation on ordinary equipment	₱59.94	Principal account surplus—Balance from last year	₱12,112.52
9-3 Depreciation on automobiles and steam wagons	1,597.36	1 Purchase of equipment	9,335.78
Principal account surplus	19,780.77		
	21,438.07		21.438.07

VI—*Baguio dwellings and equipment*

9-1 Depreciation on ordinary equipment	₱763.44	Principal account surplus—Balance from last year	₱708,249.38
Principal account surplus	716,485.94	1 Purchase of equipment	9,000.00
	717,249.38		717,248.38

Loay–Interior Road, Bohol

VII—*Benguet Automobile Line*

3 Interbureau transfers	₱3,232.30	Principal account surplus—Balance from last year	₱148,682.90
7 Sales	524.00	1 Purchase	46,892.62
9 Depreciation accruals (including Assets dropped on Inventory and Inspection Reports)	8,514.29	2 Construction	1,700.00
9–3 Depreciation on automobiles and steam wagons equipment	27,772.82	4 Found at station	79.00
10 Transfers to provinces and municipalities	3,232.30		
Principal account surplus	154,078.81		
	197,384.52		197,354.52

IX—*Maintenance and operation, irrigation systems*

Principal account surplus	₱337.27	4 Found at station	₱337.37
	337.37		337.37

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first class......Kms....	356.4
Reinforced concrete bridges and culverts completed (in this figure, concrete pipe culverts are not included)........Number....	48
Successful deep wells completed....do....	90
Reinforced concrete buildings completed (including only buildings of over 100 cubic meters capacity) ....do....	125
Irrigation projects completed ....do....	3
Waterworks projects completed (total population served, 54,300) ....do....	15

EXPENDITURES SUPERVISED DURING THE YEAR 1928 AS COMPARED WITH THE YEAR 1927

Items	1927	1928
Total expenditures	₱25,629,000.45	₱28,925,762.40
Total expended upon road and bridge work	12,075,299.80	13,884,383.27
Total expended upon building work	5,428,597.98	6,838,439.99
Total expended upon port works	3,137,225.66	2,846,691.52
Total expended upon water supply	1,824,029.20	1,700,775.38
Total expended upon irrigation projects	1,886,021.18	2,046,923.39
Operation of automobile line, quarries, and the supervision of motor vehicle traffic	365,420.23	441,950.12
Expenditures on miscellaneous items account for the balance	912,406.40	1,166,598.73

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year ending December 31, 1928, there were 5,079 motor vehicles newly registered and 24,967 re-registered for operation, or a total of 30,046 motor vehicles, as compared with 27,597 registered during 1927. There were also 2,630 motor vehicles registered for storage. During this same period 15,009 applicants for drivers' licenses were examined and 7,907 new licenses issued. Including renewals, 47,956 operators of motor vehicles were licensed during 1928.

The following is a comparative tabulation of motor vehicles registered during the years 1927 and 1928:

Vehicles	1927	1928
Automobiles	18,547	19,791
Motor trucks	8,283	9,552
Motorcycles	767	703
Total	27,597	30,049

Marilao Bridge, showing sidewalks and handrail, Bulacan

The campaign for the apprehension of violators of the Motor Vehicle Law was carried out vigorously with the aid of the Constabulary traffic officers detailed with this Bureau. During the year there were 3,326 licenses suspended and 222 revoked as compared with 2,402 licenses suspended and 101 revoked in 1927. The results of the campaign are as follows:

	Total number of cases reported		Cases for reckless driving		Cases for speeding	
	1927	1928	Number	Per cent	Number	Per cent
First quarter	1,436	2,717	231	8.5	459	17
Second quarter	1,059	1,636	319	19	383	23
Third quarter	984	1,672	201	12	95	5.6
Fourth quarter	1,359	2,478	416	17.7	227	9
Total	4,838	8,503	1,167	....	1,164	....

	1927	1928
Number of deaths caused by automobile accidents reported during the year	40	32
Number of licenses suspended during the year	2,402	3,326
Number of licenses revoked during the year	101	222
Amount of fines in violation of Automobile Law	₱14,306.42	₱20,972.00

Provisions of the Automobile Law (Act 3045) commonly violated:

	1927	1928
Section 20, overloading	1,370	1,957
Section 26 (*a*), speeding	355	1,164
Section 26 (*b*), reckless driving	841	1,163
Section 34, light	164	599
Section 14 (*h*), driving without licenses	301	536

COLLECTIONS AND EXPENDITURES

The following tabulation shows the yearly amount of funds collected and expended for the registration and regulation of motor vehicles from 1912 to 1928:

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,392.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	628,918.54	60,000.00
1924	633,214.36	50,000.00
1925	798,438.62	63,025.55
1926	985,051.28	62,555.50
1927	1,145,369.34	83,040.00
1928	1,254,684.81	88,540.00

BENGUET AUTOMOBILE LINE

During 1928, the Benguet Automobile Line operated 5 first-class White busses, 1 third-class White bus, 2 combination baggage and passenger White trucks, 4 express and freight White trucks, 10 five-passenger Dodge touring cars, 2 five-passenger Dodge sedan cars, 2 seven-passenger Studebaker touring cars, 1 seven-passenger Hudson touring car, 1 five-passenger Chevrolet touring car, 1 first- and third-class Chevrolet bus, and 1 baggage and delivery Chevrolet truck; and handled 8,056 full-rate and 405 half-rate first-class passengers, 12,280 full-rate and 2,501 half-rate third-class passengers, 3,284,012 kilos of express and freight, 7,855 pieces of hand baggage, and 122,242 kilos of "dead head" express and freight.

The total income of the line during the year including special cars hired in and around Baguio and for trips to Manila and various provinces amounted to ₱192,437.60 as compared with ₱175,250.53 during 1927 (the former figures not including Manila Railroad Company's collection for December, 1928), while the total expenditure for the year amounted to ₱185,410.12 as against ₱130,380.23 for 1927. The increased expenditure was due to purchase of three trucks and five passenger cars and the payment of ₱10,000 as flat tolls for the use of the Kennon Road.

THE USE OF THE KENNON, NAGUILIAN, CAMP ONE–DAMORTIS, AND BAGUIO–BONTOC ROADS

The gang system of maintenance was continued on the Kennon and Naguilian roads. While the macadam surfacing was maintained in a fairly satisfactory condition, the increasing amount of traffic makes it advisable to apply a surface treatment of asphalt as soon as funds can be provided for this work. This improvement would greatly reduce maintenance cost. On the Naguilian road, sharp curves were improved and split curves provided wherever necessary to further insure the safety of traffic.

The improvement of the Baguio–Bontoc road was continued up to Km. 372 and at the end of the year it was passable for small automobiles, during favorable weather conditions.

The following is a comparative statment of traffic over the Kennon and Naguilian roads for the past three years:

KENNON ROAD

Year	Pedestrians	Bull carts	Animals, led	Calesas	Motorcycles	Autos, passenger	Autos, trucks	Wagons[1]
1926	10,004	1,635	....	....	441	8,253	4,655	70
1927	12,142	2,974	175	....	470	9,317	5,890	33
1928	12,613	4,434	324	....	573	11,198	5,922	....

NAGUILIAN ROAD

Year	Pedestrians	Bull carts	Animals, led	Calesas	Motorcycles	Autos, passenger	Autos, trucks	Wagons[1]
1926	26,808	3,062	1,878	6	84	9,734	4,405	2,448
1927	26,765	2,587	2,203	....	34	11,058	7,212	2,422
1928	26,415	1,389	1,851	....	43	14,487	14,280	1,886

[1] Military wood wagons.

BAGUIO COTTAGES AND APARTMENTS

The Insular Government cottages and apartments (formerly office buildings) were leased to Government employees and private parties in accordance with the regulations governing same approved under date of June 23, 1925. As in 1927, there was a large demand for these accommodations during the past season. During the months of June, July, August, and September, a number of cottages and apartments were leased to vacationists from the China coast. The total income from the cottages and apartments during the year amounted to ₱49,962.01, while the cost of maintaining and operating same was ₱44,720.

LOS BAÑOS QUARRY

The Insular Quarry at Los Baños was not ready for operation at the new crusher site until late in the year. The delay in transferring the crushers was due to non-completion of the railroad extension, and the time consumed in finishing the bins and trestle. Of a total appropriation of ₱140,000, the sum of ₱88,000 was expended on rock production, the output for the year being 37,951 cubic meters, of all classes, valued at ₱102,793. The remainder of the appropriation was expended for the completion of the plant.

The hydroelectric plant developed a few minor defects when first put into regular service. These were corrected and the plant is now in excellent condition. An agreement was entered into to furnish power to the Navy radio station at Los Baños and before the close of the year, 24-hour service was being rendered.

Los Baños Quarry, Laguna

The College of Agriculture had not completed its transmission line before the end of the year, but the agreement had been drawn up whereby the quarry will furnish 24-hour power service at Meralco rates.

The increased output of the quarry, even under the handicaps existing, amply demonstrates that stone can be produced at a price which will enable the provinces to make greater use of its product. The Manila Railroad Company granted a 30 per cent reduction on ten-car lots during the off-sugar season, which materially aided the sale of rock. It is hoped that this reduced rate will be made an all-year tariff, thereby insuring further increase in sales.

AIDS TO NAVIGATION

A total appropriation of ₱300,000 was available for work of this nature, all of which was expended under the direction of the Bureau of Commerce and Industry, to whom the work was delegated by the Department Secretary.

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Chief Constructing Engineer*

With allotments totalling ₱4,500,000 from the Gasoline Tax Law, Act 3248, and ₱1,000,000 from the Motor Vehicle Law, Act 3045, in addition to the regular appropriations amounting to ₱10,699,691.49 provided by the Legislature and provincial boards of the various provinces, the Constructing Division was enabled to carry out the most active road construction program during 1928 in the history of the Bureau. The result was an increase of 356.4 kilometers of first-class roads as compared with an increase of 187.2 kilometers in 1927. There was also an increase of 157.6 kilometers in the length of second- and third-class roads. The total kilometerage of first-, second- and third-class roads at the end of the year was 11,892.3 kilometers.

In addition to the funds mentioned above the proceeds from the sale of provincial bonds were available to the amount of ₱1,637,000 for the construction of important permanent bridge projects in the Provinces of Nueva Ecija, Laguna, Tarlac, Bulacan, and La Union and to the amount of ₱850,000 for the construction of approximately 27 kilometers of concrete pavement on the Manila–Tarlac road in the Province of Pampanga. All of the bridge projects were practically completed at the end of the year, with the exception of the Pampanga River bridge at Cabanatuan, Nueva Ecija, which consists of 13 spans of 150-foot steel trusses on concrete piers and abut-

Batangas–Cavite Interprovincial Road, Batangas, under construction

ments. This bridge will be completed before the next rainy season and will provide a much needed improvement in view of the large amount of traffic using this crossing and the difficulty of maintaining satisfactory ferry service during the rainy season.

The finances for road maintenance work are now well provided for and while the average cost of maintaining both first-class and second- and third-class roads was slightly less than during the previous years, the cost of maintaining macadam roads carrying heavy traffic was excessively high in many cases. The construction of hard surface pavements is the proper solution of this problem, but unfortunately sufficient funds have not been available to keep up with the demand for such pavements. The revenue derived from the Gasoline Tax Law provides a limited amount of money for this work and a total of 38 kilometers of asphalt pavement constructed during the year was financed from this source. The delay in releasing these funds, however, resulted in approximately ₱3,000,000 remaining unexpended at the end of the year.

Funds from the 25 per cent discretionary portion of the Gasoline Tax Law Fund were expended largely for the improvement of roads carrying heavy traffic. A considerable amount of improvement work was accomplished on the Manila–North and Manila–South roads and also on roads leading from the cities of Cebu, Iloilo, and Legaspi. These improvements consisted of the elimination of dangerous curves, widening narrow sections of road and narrow culverts and bridges, constructing diversion roads to by-pass towns where adequate rights-of-way could not be secured at a reasonable cost and in asphalting sections of roads through towns and barrios to eliminate the dust nuisance and to reduce the cost of maintenance. A large amount of similar work remains to be done on roads subjected to heavy traffic.

The following tables show the total amount of funds provided for road and bridge purposes, the amounts expended for maintenance and construction, the cost of road maintenance in each province, and the average cost of maintaining the different classes of roads during the year:

TABLE I.—FUNDS FOR ROAD AND BRIDGE CONSTRUCTION AND MAINTENANCE

Year	General taxation (Provincial road and bridge funds)	Act 3045 (Automobile registration and license fees)	Insular appropriation	Act 3248, levying a special tax on motor spirits	Total
1922....	₱4,469,555.00	₱518,825.85	₱3,245,000.00	....	₱8,233,380.00
1923....	3,999,756.00	628,918.54	2.380,000.00	....	7,008,674.54
1924....	4,326,878.00	633,214.36	2,400,000.00	....	7,360,092.36
1925....	4.406,320.00	798,438.62	2,517,327.00	....	7,722,085.62
1926....	5,871,384.99	985,051.28	2,705,000.00	....	9,561,436.27
1927....	7,476,690.00	1,145,369.34	4,436,500.00	₱2,926,098.38	15,984,658.55
1928....	7,876,691.49	1,000,000.00	2,816,000.00	4,500,000.00	16,192,691.49

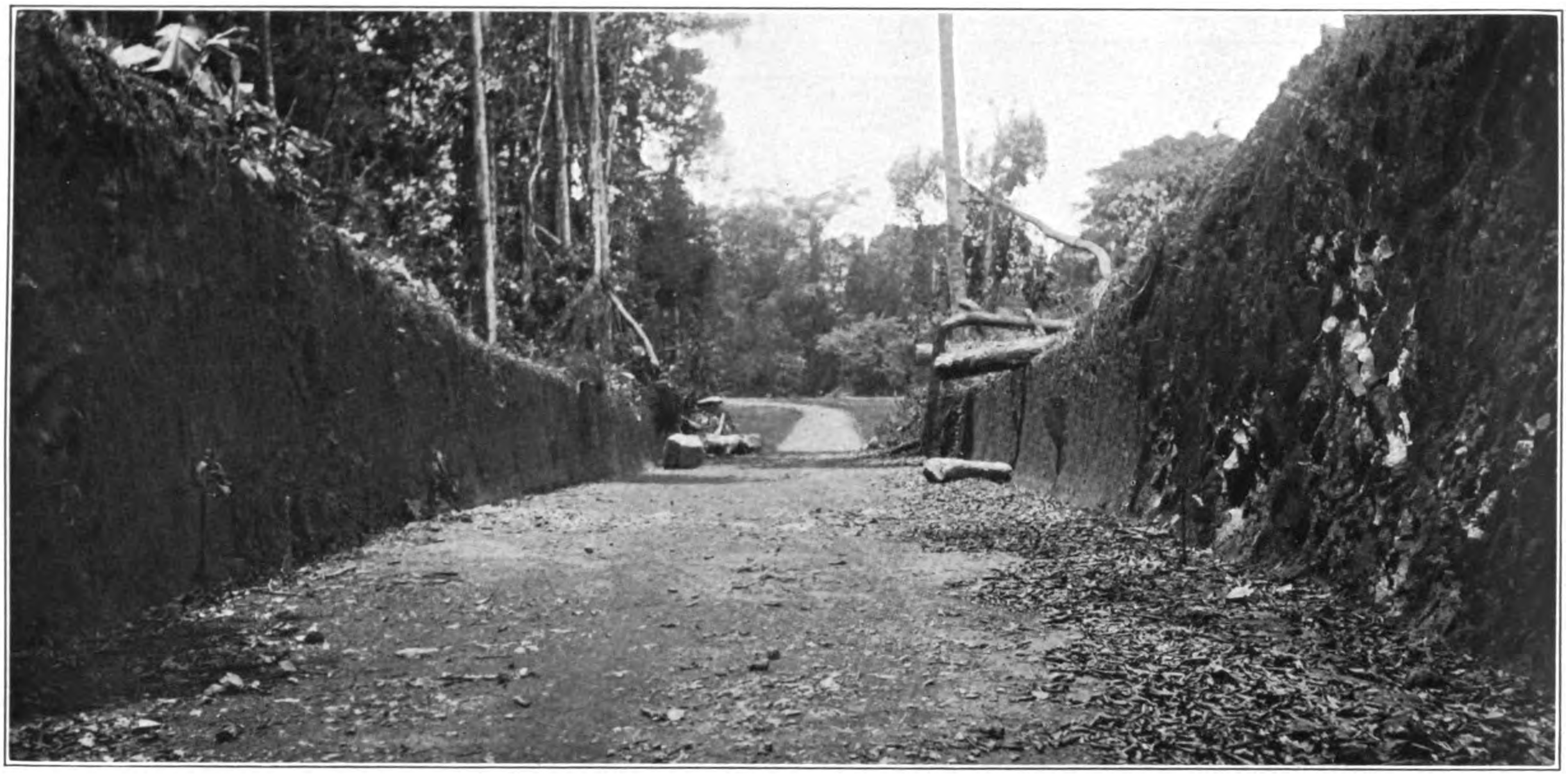
First-class roads.—Well graded and surfaced, thoroughly drained, and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. These roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first- and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

TABLE II.—AMOUNT EXPENDED FOR ROAD AND BRIDGE CONSTRUCTION AND MAINTENANCE

Year	Maintenance	Construction	Total
1922........................	₱5,050,554.19	₱2,197,565.64	₱7,248,119.83
1923........................	5,356,230.19	2,007,147.78	7,363,377.92
1924........................	5.693,466.40	2,619,316.68	8,312,783.08
1925........................	5,873,078.63	3,545,890.66	9,418,969.29
1926........................	5,806.013.33	3,689,750.14	9,495,763.47
1927........................	6,525,639.46	6.006.544.21	12,532,183.67
1928........................	6,266,100.57	6,572,885.60	12,828,986.17



Tayabas–Camarines Norte Interprovincial Road, Camarines Norte, under construction

TABLE III.—MAINTENANCE OF FIRST-, SECOND-, AND THIRD-CLASS ROADS

Province	First class			Second- and third-class roads			Trails
	Length of first-class roads	Total expenditures for maintenance of first-class roads	Average cost per kilometer of maintenance	Length of second- and third-class roads	Total expenditures for maintenance of second- and third-class roads	Average cost per kilometer of maintenance	Total expenditures
Abra	73.2	₱30,466.39	₱416.20	31.0	₱1,455.70	₱46.96	₱4,923.26
Agusan	....	....	....	57.6	37,300.28	647.57	1,401.81
Albay	231.6	120,008.77	518.17	59.7	2,533.26	42.43	....
Antique	98.7	77,338.90	783.58	134.3	22,228.51	165.51	....
Bataan	45.3	41,402.48	913.96	20.3	4,063.94	101.67	576.07
Batanes	....	....	....	11.5	....	....	....
Batangas	208.5	126,153.28	605.08	203.4	23,109.95	113.61	....
Benguet and the City of Baguio	133.3	188,062.71	2,597.55	177.1	23,011.74	129.90	55,813.34
Bohol	260.4	90,761.95	348.55	163.2	42,592.40	260.98	....
Bukidnon	....	....	....	163.4	59,201.27	362.31	....
Bulacan	122.7	116,812.62	952.01	202.4	58,136.19	287.23	....
Cagayan	74.9	56,601.56	755.69	181.2	23,608.72	130.29	....
Camarines Norte	40.9	36,490.40	892.19	41.5	4,695.44	113.14	....
Camarines Sur	162.0	132,188.00	815.98	110.2	44,404.00	402.94	....
Capiz	204.1	141,516.70	693.37	110.4	13,751.14	124.55	....
Cavite	100.2	79,132.09	789.75	51.5	21,109.18	409.88	....
Cebu	337.3	251,418.21	745.38	386.6	82,549.15	213.53	....
Cotabato	27.3	17,885.35	655.14	44.5	5,843.65	131.32	24,998.80
Davao	35.0	46,918.00	1,340.52	52.4	19,182.74	366.08	....
Ilocos Norte	91.4	62,149.68	679.98	138.2	48,734.48	352.64	7,218.87
Ilocos Sur	187.7	149,596.73	797.00	33.7	33,719.38	1,000.58	5,719.87
Iloilo	309.6	218,503.28	705.76	211.8	9,464.26	44.77	....
Isabela	102.7	79,792.13	776.94	148.0	8,688.40	24.92	....
Laguna	172.6	222,756.48	1,290.59	79.1	12,545.70	158.60	....
Lanao	43.4	40,453.47	932.11	67.1	11,091.79	165.30	....
La Union	121.9	62,631.38	513.79	58.0	57,923.64	9,986.83	17,845.23
Leyte	141.8	191,864.21	1,353.06	177.8	115,931.32	652.08	6,407.32
Marinduque	51.5	25,680.74	502.56	41.2	5,439.32	132.02	2,461.47
Masbate	44.6	17,804.83	399.21	24.6	550.81	22.39	....
Mindoro	54.8	26,228.55	478.62	70.8	13,936.04	154.90	3,046.55
Misamis	128.4	97,199.28	757.00	170.6	46,575.53	273.01	....
Mountain Province	....	....	....	317.4	48,221.19	151.93	118,659.96
Nueva Ecija	261.2	269,215.25	1,028.39	238.1	35,293.27	148.23	....
Nueva Vizcaya	81.8	54,302.81	663.85	68.6	13,161.08	191.99	4,403.77
Occidental Negros	390.5	268,573.76	687.77	106.6	34,632.75	324.88	....
Oriental Negros	188.0	117,761.49	626.39	115.8	18,563.85	160.31	....
Palawan	....	....	....	74.5	27,929.46	374.89	....
Pampanga	203.9	230,651.45	998.77	161.8	20,363.31	125.85	....
Pangasinan	514.9	397,105.20	751.80	200.8	31,316.72	155.95	4,981.24
Rizal	194.4	342,777.60	1,763.26	65.0	1,625.65	25.01	....
Romblon	....	....	....	71.7	24,012.90	334.91	....
Samar	110.6	71,489.39	646.38	253.5	44,221.55	174.44	....
Sorsogon	161.5	119,634.82	740.77	33.4	15,608.44	....	....
Sulu	41.8	28,080.43	671.78	19.6	13,702.65	699.11	....
Surigao	63.8	48,001.65	752.38	48.7	10,957.96	225.01	....
Tarlac	178	159,657.98	896.95	38.7	5,869.93	151.68	....
Tayabas	205.5	167,619.20	815.66	112.3	6,701.86	59.67	....
Zambales	116.2	36,389.06	313.16	34.4	7,994.05	213.74	....
Zamboanga	62.1	64,834.45	1,044.03	125.3	44,728.79	356.97	....
Total	6,380.0	5,096,897.71	....	5,512.3	1,253,283.84	....	258,457.56

TABLE IV.—AVERAGE COST OF MAINTENANCE OF FIRST-, SECOND-, AND THIRD-CLASS ROADS

Year	First class			Second class		
	Total length in kilometers maintained throughout the year	Total cost of maintenance	Average cost per kilometer maintained	Total length in kilometers maintained throughout the year	Total cost of maintenance	Average cost per kilometer maintained
1922	4,854.5	₱4,205,289.25	₱866.27	3,389.4	₱812,581.82	₱239.74
1923	3,014.3	4,367,742.20	871.06	3,535.6	955,440.81	270.23
1924	5,213.0	4,461,035.06	855.75	3,840.3	1,028,547.73	267.83
1925	5,517.6	4,801,567.32	870.23	4,281.8	1,071,511.31	250.25
1926	5,846.7	4,638,373.12	793.33	5,044.2	1,031,788.58	204.55
1927	6,033.9	5,048,541.05	836.70	5,354.7	1,365,033.57	254.90
1928	6,380.0	5,102,917.71	799.83	5,512.0	1,253,283.35	227.37

TABLE V.—INCREASE IN FIRST-CLASS ROAD KILOMETERAGE DURING THE YEAR 1928

Province	Roads in existence December 31, 1927	Roads in existence December 31, 1928	Increase during the year 1928
Abra	64.4	73.2	8.8
Agusan	....	....	....
Albay	217.8	231.6	13.8
Antique	108.8	98.7	[a] (10.1)
Baguio	57.0	60.9	3.9
Bataan	41.3	45.3	4.0
Batangas	208.5	208.5	....
Benguet	72.4	72.4	....
Bohol	249.6	260.4	10.8
Bukidnon	....	....	....
Bulacan	116.3	122.7	6.4
Cagayan	74.0	74.9	.9
Camarines Norte	34.3	40.9	6.6
Camarines Sur	162.0	162.0	0.0
Capiz	204.1	204.1	0.0
Cavite	99.5	100.2	0.7
Cebu	337.3	337.3	....
Cotabato	25.3	27.3	2.0
Davao	30.8	35.0	4.2
Ilocos Norte	91.4	91.4	0.0
Ilocos Sur	184.2	187.7	3.5
Iloilo	287.1	309.6	22.5
Isabela	86.1	102.7	16.6
Laguna	161.4	172.6	11.2
Lanao	43.4	43.4	....
La Union	121.1	121.9	.8
Leyte	141.8	141.8	....
Marinduque	51.5	51.5	....
Masbate	44.6	44.6	....
Mindoro	55.0	54.8	[a] (0.2)
Misamis	122.0	128.4	6.4
Mountain Province	....	....	....
Nueva Ecija	208.2	261.2	53.0
Nueva Vizcaya	66.5	81.8	15.3
Occidental Negros	363.9	390.5	26.6
Oriental Negros	179.3	188.0	8.7
Palawan	....	....	....
Pampanga	203.4	203.9	.5
Pangasinan	499.2	514.9	15.7
Rizal	191.6	194.4	2.8
Romblon	....	....	....
Samar	110.6	110.6	....
Sorsogon	130.7	161.5	30.8
Sulu	26.8	41.8	15.0
Surigao	54.3	63.8	9.5
Tarlac	161.8	178.0	16.2
Tayabas	199.6	205.5	5.9
Zambales	82.9	116.2	33.3
Zamboanga	62.1	62.1	....
Total	6,033.9	6,380.0	346.1

[a] Decrease due to remeasurement of roads.

TABLE VI.—TYPE OF SURFACING

	December 31, 1926	December 31, 1927	December 31, 1928
	Kilometers	*Kilometers*	*Kilometers*
Concrete	2.5	3.8	4.8
Asphalt	9.2	28.0	66.0
Macadam	1,660.1	1,696.8	1,695.4
Gravel	3.899.9	4,127.8	4,511.1
Coral	1,920.2	2,246.6	2,423.8
Unsurfaced	3,446.5	3,285.6	3,191.2
Total	10,938.4	11,388.6	11,892.3

The following is a brief description of the more important road construction projects:

Agusan–Surigao Interprovincial Road, Agusan Province.—This road is 44.4 kilometers long and is the first step in providing a land route to connect the Provinces of Agusan and Surigao. During the past year, 10.5 kilometers of road were graded at a cost of ₱21,827.86.

Ligao–Panganiran Road, Albay Province.—This road is 35 kilometers long and will connect the town of Ligao with the west coast of the province and open up extensive agricultural lands for development. The work accomplished during the year included 8.8 kilometers of subgrade, 4.7 kilometers of metalling, and the construction of several timber trestle bridges. The amount expended during the year was ₱42,331.31.

Bataan–Zambales Interprovincial Road.—The work accomplished on this road, which is 19.5 kilometers long in Bataan Province, consisted in the widening of 5.5 kilometers of trail and the reconstruction and repair of 3.5 kilometers of the old subgrade. Temporary timber bridges were also constructed over two rivers and five creeks. The total expenditure during the year amounted to ₱39,743.10.

In Zambales Province, the road is 22.2 kilometers long and passes through a U. S. Naval Reservation at Olongapo. The section between Subic and Olongapo, a distance of 11 kilometers, has been completed as first-class road and a 2-meter trail has been constructed between Olongapo and Bataan boundary. The total expenditure during the year was ₱29,982.99.

Batangas–Cavite Interprovincial Road, Batangas Province.—This road will connect Tuy (Batangas) with Indang via Mendez (Cavite) and will be 18.4 kilometers long on the Batangas side. The work accomplished during the year was the completion of 2.5 kilometers of subgrade, two kilometers of first course surfacing, and the construction of temporary timber bridges and several pipe culverts. The total amount expended was ₱47,447.48.

In Cavite Province, the amount expended was ₱27,075.76 and the work accomplished was the completion of 1.0 kilometer of first-class road and 8 kilometers of subgrade. The Cavite section is 22.2 kilometers long.

This road, when completed, will give the western towns of Batangas a more direct route to Cavite and Manila and at the same time provide an outlet for large tracts of land planted to sugar cane and coconuts. It will also make possible the establishment of the proposed health and summer resort on the Tagaytay Ridge, which is over 2,000 feet above sea level.

Loay–Interior Road, Bohol Province.—This project starts from the town of Loay on the south coast of the island of Bohol and ends at the barrio Ipil on the north cost, a distance of 79.4 kilometers. The total expenditure was ₱45,033.32, during 1928. The subgrade work was completed to the barrio of Ipil, including the construction of several temporary timber bridges and concrete pipe culverts.

Manila North Diversion Road, Bulacan Province.—Three diversions are being constructed to by-pass the towns of Marilao, Meycauayan, Bocaue, San Miguel, and Polo, in order to eliminate dangerous curves and narrow road sections on the present road, and to relieve the congestion of traffic in these towns. The total expenditure on this project during the year amounted to ₱248,711.60.

Cagayan Valley Road, Cagayan Province.—The work accomplished during the year was the completion of 22.53 kilometers of second-class road, the reconstruction of several temporary timber bridges, and the construction of concrete pipe culverts. The total expenditure was ₱154,796.38.

Cagayan Valley Road, Isabela Province.—The work accomplished during the year consisted of the completion of a first-class road from Cauayan to Naguilian, 14.6 kilometers, the repair of temporary structures, and the delivery of surfacing material along the Ilagan–Naguilian section. The total expenditure amounted to ₱184,638.89.

Cagayan Valley Road, Nueva Vizcaya Province.—11.36 kilometers of first-class road was completed with a total expenditure of ₱56,190.85.

Cagayan Valley Road, Nueva Ecija Province.—The work on this project was confined to the widening of the section between Km. 205 and Km. 211. Two kilometers of road was also widened between Km. 211 and Santa Fe. Several sections which were damaged by the extraordinary heavy rains in November were resurfaced. The total amount expended during 1928 was ₱67,782.17.

Capiz–Antique Interprovincial Road, Capiz Province.—This road is 60.9 kilometers long and will connect the Ilayan and Aklan sections of the province. The work accomplished consisted of the repair of 12 kilometers of subgrade, placing of 11.5 kilometers of first course surfacing and the construction of several timber bridges and concrete pipe culverts, with a total expenditure of ₱52,566.10.

Capiz–Iloilo Interprovincial Road, Capiz Province.—The section on the Capiz side is 30.4 kilometers long, 10 kilometers of which were graded during 1928. Several temporary timber bridges and concrete pipe culverts were also constructed. The total expenditure amounted to ₱27,228.49.

On the Iloilo side, the road is 10.9 kilometers long. The work on this project during the year was the completion of 6.2 kilometers of subgrade, at a total cost of ₱24,486.70.

Cotabato–Davao Interprovincial Road, Cotabato Province.—This project is 139.0 kilometers long. Starting from the Cotabato–Parang road it passes through 16 kilometers of rolling country to the barrio of Manuangan; thence through rolling country to Pikit; thence through flat and fertile land to Kabakan and Kidapawan. The location survey and estimate of cost were completed during the year. Construction work was also accomplished on 4.5 kilometers of subgrade. The total expenditure during the year amounted to ₱24,208.85.

In Davao Province, this road is 115.8 kilometers long, extending from the town of Davao to Cotabato boundary, and passing through a highly developed country between Davao and Santa Cruz. The location survey and estimate of cost were completed during the year. Construction work accomplished included 5 kilometers of subgrade and two kilometers of surfacing. The total expenditure was ₱41,016.95.

Cotabato–Lanao Interprovincial Road, Cotabato Province.—The Cotabato section of this road is 82.75 kilometers long, from the town of Cotabato to the Lanao boundary. The amount of ₱39,828.62 was expended for the construction of 6.5 kilometers of subgrade, placing 6.17 kilometers of first course metalling, and several concrete pipe culverts.

In Lanao Province, the road is 105.0 kilometers long. The sum of ₱65,460.85 was expended for surveys, preparation of plans and estimate, and for the completion of 8.5 kilometers of subgrade, 3 kilometers of first-class road and the construction of concrete pipe culverts.

Camarines Norte–Camarines Sur Interprovincial Road, Camarines Norte Province.—This road is 16 kilometers long in Camarines Norte and is a section of Manila–South Road. It traverses a mountainous country with heavy forest. The work accomplished during the year included the grading of 7 kilometers of road and the construction of temporary bridges and concrete pipe culverts, at a total cost of ₱27,840.62.

In Camarines Sur, the road is 62 kilometers long and the work accomplished consisted of the construction of 25 kilometers of 2- to 5-meter subgrade and 12 kilometers of 2-meter metalling, with a total expenditure of ₱33,629.68.

Camarines Norte–Tayabas Interprovincial Road, Camarines Norte Province.—The total expenditure on this project, 78.0 kilometers long, amounted to ₱36,096.22 during the year. The work accomplished was the grading of 5 kilometers of road and the construction of temporary bridges and concrete pipe culverts.

In Tayabas Province, the road is 62.6 kilometers long and ₱30,331.96 was expended for the construction of a 4-meter trail, 14.5 kilometers long, and the completion of 3 kilometers of full-width subgrade.

Baybay–Abuyog Road, Leyte Province.—During 1928, the sum of ₱41,632.20 was expended on 9 kilometers of subgrade work and for constructing several temporary structures.

Misamis–Zamboanga Interprovincial Road (Dapitan–Plaridel Section), Misamis Province.—This section is 25.22 kilometers long. The work accomplished was the clearing of 7 kilometers of heavy forest and the grading of 4 kilometers of road, at a cost of ₱21,041.96.

In Zamboanga Province, the road is 34 kilometers long and ₱25,102.51 was expended on 3 kilometers of subgrade work, two of which were through solid rock, and for surfacing one kilometer of road, including some timber bridges.

Occidental Negros–Oriental Negros Interprovincial Road.—In Occidental Negros this road is 34.7 kilometers long and the work accomplished was the completion of the subgrade work and the metalling of several kilometers of road, with a total expenditure of ₱37,991.96. This road is now open to traffic during the dry season.

The Oriental Negros section of this road is 34 kilometers long and the work accomplished was the completion of 17 kilometers of second-class road and the construction of several temporary timber bridges. The total amount expended was ₱29,946.16.

Pampanga Concrete Road Pavement, Pampanga Province.—This project consists of the construction of a concrete pavement, 6 meters wide and 15 centimeters thick, on a section of the Manila–Tarlac Road from Km. 60.2 to Km. 71.5 and from Km. 73 to Km. 87.5. During the year, ₱30,016.21 was expended to construct 1.01 kilometers of pavement.

Taft Avenue Extension, Rizal Province.—This project contemplates the extension of Taft Avenue from Manila through the municipality of Pasay. It is 3.34 kilometers long, in Rizal Province. The subgrade was practically finished and 1.47 kilometers of first course adobe foundation stone laid and rolled. The total expenditure during the year amounted to ₱71,760.80.

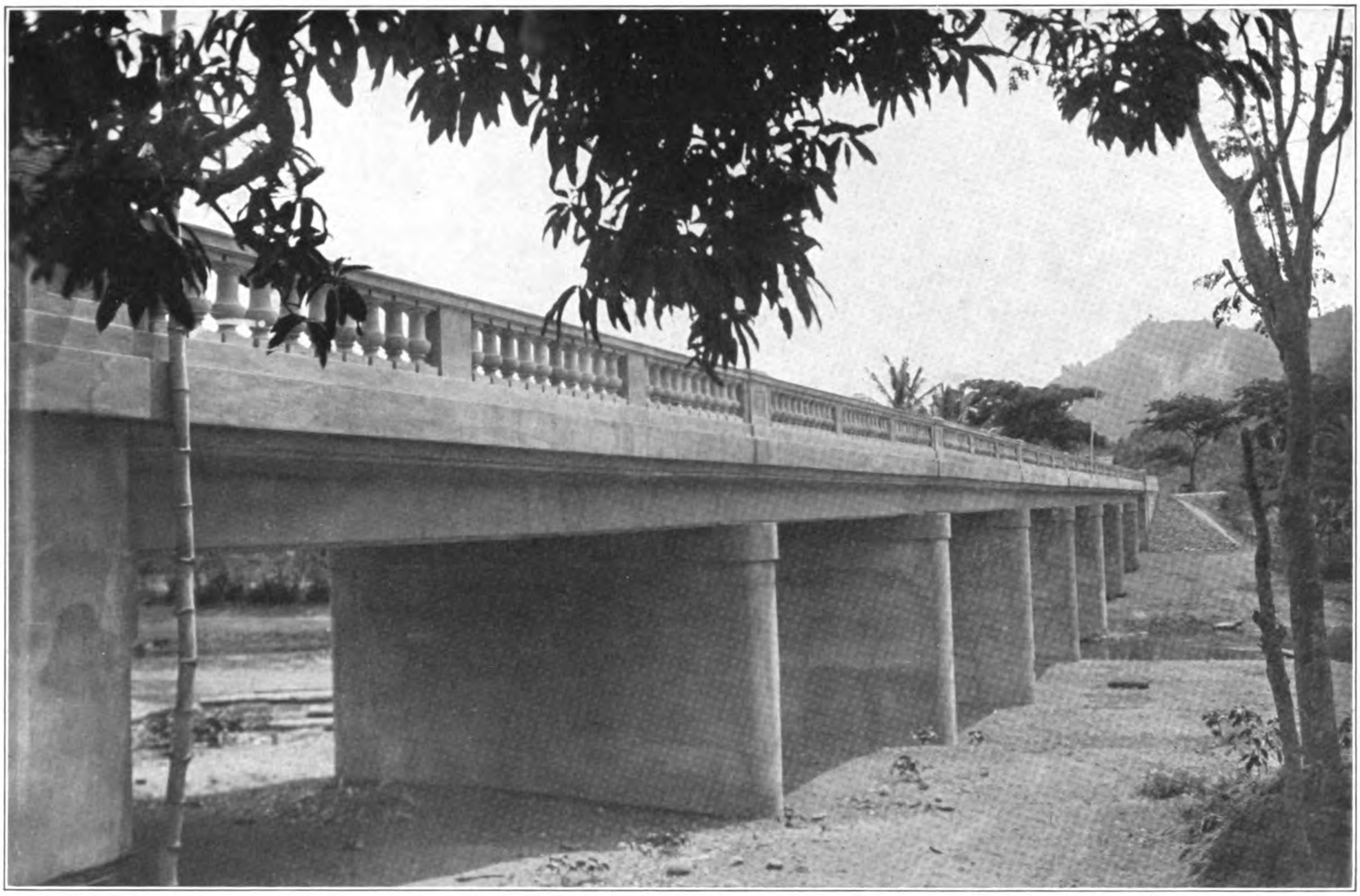
Rizal Avenue Extension, Rizal Province.—This road is an extension of Rizal Avenue from the city limits through the municipality of Caloocan to the Bulacan boundary. It has a total length of 3.83 kilometers and a right-of-way 25 meters wide from the city limit to Samson Street (2.25 kms.) and 20 meters wide from Samson Street to the Bulacan boundary. The work accomplished during the year was the completion of the subgrade and the metalling of the entire road, at a total cost of ₱47,578.85.

Catbalogan–North Road, Samar Province.—This road, when completed, will connect the capital of the province with the municipalities on the north coast of Samar. The length of the Catbalogan–Oquendo section is 88.2 kilometers. The work accomplished during the year was the widening of the subgrade from Km. 28 to Km. 44, the construction of temporary bridges and concrete pipe culverts, and the surfacing with first course of 6.07 kilometers of road. The total expenditure during the year amounted to ₱91,969.18.

Catbalogan–Taft Road, Samar Province.—This is an intercoastal road, 94.0 kilometers long, connecting Catbalogan on the west coast and Taft on the east coast. The sum of ₱42,419.03 was expended during the year for the completion of the location survey and for constructing 2.7 kilometers of subgrade work and 3.7 kilometers of first course surfacing.

TABLE VII.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1928

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1928	Appropriations in 1928	Total expenditure to December 31, 1928	Expenditure in 1928	Work accomplished		Remarks
								To date	During 1928	
		Kms.						*P. ct.*	*P. ct.*	
Abra	Peñarrubia–Villaviciosa–Pilar Road.	27.0	₱165,000.00	₱78,018.88	₱30,192.00	₱62,654.22	₱15,438.28	38	10	Surfacing.
Do.	Bangued–La Paz–Lagayan Road	20.0	150,000.00	37,450.18	5,500.00	36,973.65	1,580.80	25	0	Improvement of subgrade.
Agusan	Agusan–Surigao Interprovincial Road.	44.4	1,392,000.00	52,438.65	21,843.90	52,422.64	21,827.86	4	2	Grading.
Do.	Butuan–Nasipit Road	24	400,000.00	69,586.68	29,075.00	67,334.07	27,025.92	17	7	Do.
Do.	Butuan–Cabadbaran Road	29	325,000.00	299,034.36	8,763.76	299,033.20	3,762.60	93	1	Improvement of road.
Albay	Naga–Joroan Road	6.3	68,560.00	64,167.71	13,449.00	62,980.71	12,252.00	92	18	Grading and surfacing.
Do.	Masarawag–Amtic Road	9.0	80,000.00	26,657.23	2,000.00	26,223.40	1,566.17	33	2	Improvement of subgrade.
Do.	Estancia–Malinao Road	7.98	74,754.00	20,148.54		19,985.76	4,098.09	27	5	Surfacing.
Do.	Ligao–Panganiran Road	35.0	350,000.00	56,237.94	45,000.00	50,676.82	42,331.31	15	12	Grading, surfacing and temporary bridges.
Do.	Legaspi-Manito Road	30.0	300,000.00	65,969.27	42,796.00	53,066.82	32,867.23	18	11	Do.
Do.	Daraga–Gapo Road	3.3	48,382.00	15,623.56	8,390.00	15,420.31	13,174.84	32	27	Grading and pipe culverts.
Do.	Camalig–Tagaytay Road	1.8	13,000.00	13,069.00	13,069.17	11.246.64	4,174.47	86	32	Grading and surfacing.
Do.	Bagacay–Pili Road	4.52	25,000.00	8,500.00	8,500.00	8,323.60	8,323.60	33	33	Do.
Do.	Barrio Obrero Road	2.02	16,500.00	14,256.87	8,645.62	13,586.12	7,974.87	82	21	Do.
Do.	Padnan–Caramoran Road	9.4	123,534.00	26,476.89	7,850.00	26,072.62	11,095.11	21	9	Grading, surfacing and pipe culverts.
Do.	Viga–Panganiban Road	4.83	27,844.00	27,672.36	14,783.00	19,870.38	6,812.61	71	25	Grading, surfacing, and temporary bridges.
Do.	Bato–Baras Road	10.2	100,000.00	24,365.63	11,889.00	24,166.74	15,507.78	24	16	Grading and surfacing.
Antique	Asluman–Anini-y Road	25	150,000.00	63,340.26	19,000.00	60,430.84	16,093.54	40	9	Surfacing and pipe culverts.
Do.	Patnongon–North Road	97.0	600,000.00	308,995.97	30,160.46	307,196.87	28,361.36	51	5	Grading, surfacing and concrete culverts.
Do.	Antique–Iloilo Interprovincial Road.	11.1	300,000.00	288,006.85	20,000.00	285,013.73	17,078.71	95	6	Surfacing and concrete culverts.
Do.	Igbalangao–Valderrama Road	11.2	145,000.00	37,545.86	21,162.00	25,488.11	9,150.55	18	6	Grading and temporary bridges.
Bataan	Orion–Limay Road	8.1	65,000.00	57,567.96	18,818.95	57,409.15	18,660.14	88	29	Grading and surfacing.
Do.	Bataan–Zambales Interprovincial Road.	19.5	313,235.00	166,181.55	48,577.82	157,346.83	39,743.10	51	13	Grading, surfacing and temporary bridges.
Batangas	Lipa–Balete Road	11.85	98,192.00	78,209.87	14,673.00	68,544.98	7,603.61	70	8	Grading.
Do.	Bauan–Mabini Road	10.4	173,783.00	30,206.57		14,407.16	3,144.83	8	7	Do.
Do.	Cuenca–Banaybanay Lipa Road.	13.7	220,740.00	50,378.07	28,400.00	36,849.56	19,205.21	17	9	Grading and surfacing.
Do.	Bolbok–Tayabas Boundary Road	3.7	25,000.00	25,013.93		25,013.93	6,594.18	100	39	Do.
Do.	Batangas–Cavite Interprovincial Road.	18.4	225,000.00	60,498.70	25,000.00	56,685.46	47,447.48	25	21	Grading, surfacing pipe culverts and temporary bridges.
Do.	Tanauan–Laguna Boundary Road.	7.36	112,931.00	41,118.08	20,000.00	41,038.61	20,727.01	36	18	Surfacing and concrete culverts.
Do.	Rosario–Taysan Road	7.36	173,571.00	19,193.33	10,673.00	11,516.79	9,330.73	7	5	Grading and surfacing.
Do.	Tuy–Calatagan Road	28.1	350,000.00	30,719.14	10,000.00	29,787.77	16,723.46	9	5	Grading, surfacing, pipe culverts and temporary bridges.
Do.	Government Center Roads		15,700.00	15,702.45	15,702.45	15,374.76	15,374.76	100	100	Grading and surfacing.
Do.	Alitagtag–San Luis Road	8.92	152,725.00	10,000.00	10,000.00	4,704.02	4,704.02	3	3	Grading.
Do.	Taal–San Nicolas Road	7.0	75,000.00	5,000.00	5,000.00	4,938.97	4,938.97	7	7	Grading and surfacing.
Do.	Lipa–San Jose Road	10.8	45,000.00	22,000.00	22,000.00	6,734.44	6,734.44	15	15	Do.
Bohol	Loay–Interior Road	79.4	624,902.00	459,414.18	640.00	433,074.13	45,033.32	69	7	Grading, surfacing, pipe culverts and temporary bridges.
Do.	Batuanan–Ubay Road	20.8	212,000.00	63,955.51	43,588.00	56,061.88	49,209.75	19	17	Do.
Do.	Inabanga–Jetafe Road	20.8	180,300.00	66,211.48	41,000.00	57,440.22	53,532.22	32	30	Do.
Bukidnon	Valencia–Maramag Road	21	200,000.00	17,400.26	10,000.00	16,797.24	9,485.92	8	5	Grading and temporary bridges.
Do.	Malaybalay–Valencia Road	31	300,000.00	10,000.00	10,000.00	9,974.76	9,974.76	3	3	Grubbing and grading.
Bulacan	Marilao–Diversion Road	0.69	26,000.00	26,000.00	26,000.00	20,286.78	20,286.78	78	78	Grading and surfacing.
Do.	Meycauayan Diversion Road	1.71	59,000.00	59,212.14		55,975.38	45,439.14	95	77	Do.
Do.	Bocaue Diversion Road	0.96	32,300.00	32,299.92		27,081.99	21,609.09	84	67	Do.
Do.	San Miguel Diversion Road	3.96	79,000.00	78,905.28		71,635.83	55,148.59	91	70	Do.
Do.	Polo Diversion Road	6.48	130,000.00	130,000.00	100,000.00	96,208.00	96,208.00	74	74	Do.
Cagayan	Cagayan–Valley Road	117.0	1,194,700.00	840,619.23	149,454.20	840,169.77	154,796.38	70	13	Surfacing, pipe culverts and temporary bridges.
Do.	Cagayan–Ilocos Norte Road	95.0	1,000,000.00	107,384.35	30,134.85	107,384.35	30,134.85	9	3	Grading.
Do.	Cagayan–Mountain Province Road.	68.5	500,000.00	28,262.33	12,653.39	27,965.25	16,902.92	6	3	Grading and surfacing.
Do.	Tuguegarao–Peñablanca Road	7.97	90,200.00	13,163.50	9,989.36	13,108.15	9,944.65	15	11	Grading.
Do.	Baybayug–Baggao Road	11.79	92,900.00	19,548.28	8,967.64	19,383.65	8,833.26	21	9	Grading and temporary bridges.
Camarines Norte	Camarines Norte–Camarines Sur Interprovincial Road.	16	498,128.00	83,034.66	25,000.00	82,970.16	27,840.62	17	6	Grading, surfacing, and temporary bridges.
Do.	Labo–Batobalane–Paracale Road	32	350,000.00	172,403.68	32,958.72	174,013.50	34,331.25	50	10	Do.
Do.	Camarines Norte–Tayabas Interprovincial Road.	78.0	1,366,000.00	71,779.60	30,000.00	68,425.60	36,096.22	5	3	Grading and temporary bridges.
Camarines Sur	Calabanga–Tinambac Road	19.3	200,000.00	20,003.81	10,000.00	13,385.91	13,316.64	7	7	Grading, surfacing and collapsible bridge.
Do.	Camarines Sur–Camarines Norte Interprovincial Road.	62.0	1,760,000.00	82,554.73	25,000.00	80,040.61	33,629.68	4	2	Grading and surfacing.
Do.	Naga–Banao Junction Road	17.4	392,700.00	360,773.11	76,255.00	337,124.59	67,992.69	86	17	Surfacing and temporary bridges.
Do.	Cabusao–Libmanan Road	7.1	70,000.00	13,000.00	13,000.00	11,653.11	11,653.11	17	17	Grading, surfacing and pipe culverts.
Capiz	Capiz–Antique Interprovincial Road.	60.9	1,162,000.00	128,460.32	57,558.00	121,457.82	52,566.10	10	5	Surfacing, pipe culverts and temporary bridges.
Do.	Capiz–Iloilo Interprovincial Road.	30.4	300,000.00	50,745.50	25,000.00	40,772.39	27,228.49	14	9	Grading and temporary bridges.
Do.	Banga–Libacao Road	18.9	285,000.00	41,136.00	20,000.00	40,494.68	19,854.11	14	7	Do.
Do.	Baybay–Culasi Road	4.4	44,100.00	24,000.00	24,000.00	21,033.58	21,033.58	48	48	Grading, surfacing and pipe culverts.
Do.	Cuartero–Dumalag Road	5.57	60,354.00	17,998.00	17,998.00	10,225.09	10,225.09	17	17	Do.
Do.	Panay–Pontevedra Road	10.5	150,000.00	15,000.00	15,000.00	12,104.23	12,104.23	8	8	Do
Cavite	Naic–Maragondon Road	6.1	45,000.00	44,116.62	5,000.00	44,056.07	4,899.45	100	4	Surfacing.
Do.	Noveleta Bridge Diversion		13,600.00	13,500.00	13,500.00	10,361.76	10,361.76	100	100	Grading and surfacing.
Do.	Noveleta–Amaya Road	10.6	120,000.00	116,789.99	2,500.00	116,671.74	2,487.20	100	4	Surfacing.
Do.	Tanza–Quintana Road	11.3	54,689.00	12,844.04	4,587.16	12,741.18	10,175.01	23	19	Grading.
Do.	Naic-Sahing–Quintana Road	11.0	52,682.00	8,256.88	4,587.16	6,448.57	2,778.85	12	5	Do.
Do.	Buenavista–Halang Road	12.89	180,985.00	22,935.79	4,587.16	22,553.11	4,168.48	12	2	Do.
Do.	Cavite-Batangas Interprovincial Road.	22.2	273,271.00	68,260.03	26,000.00	68,233.19	27,075.76	25	10	Grading and surfacing.
Do.	Naic–Molino Road	7.6	40,000.00	11,926.61	4,587.16	11,920.12	6,842.20	30	17	Grading.
Cebu	Curva–Tindog Road	2.12	10,000.00	6,719.65	6,719.65	4,835.96	4,835.96	48	48	Do.
Do.	Bantayan–Madridejos Road	16.0	40,000.00	18,000.00	18,000.00	15,517.57	15,517.57	39	39	Grading and surfacing.
Do.	Medellin Puerto Cawit Road	7.4	50,000.00	42,000.00	42,000.00	19,092.07	19,092.07	38	38	Grading.
Do.	Bogo Nailong Road	3.8	26,400.00	22,755.09	4,000.00	22,755.09	9,037.80	100	25	Grading and surfacing.
Do.	Logo-Taboilan Road	21.00	260,000.00	218,127.77	63,000.00	209,430.00	71,597.02	80	27	Grading, pipe culverts and temporary bridges.
Do.	Cebu-South Road	133.0	684,564.00	290,831.77	11,669.00	290,831.77	11.669.00	47	2	Surfacing.
Do.	Toledo-Aloguinsan Road	24.6	150,000.00	32,154.90	6,280.35	32,154.90	6,280.00	21	4	Do.



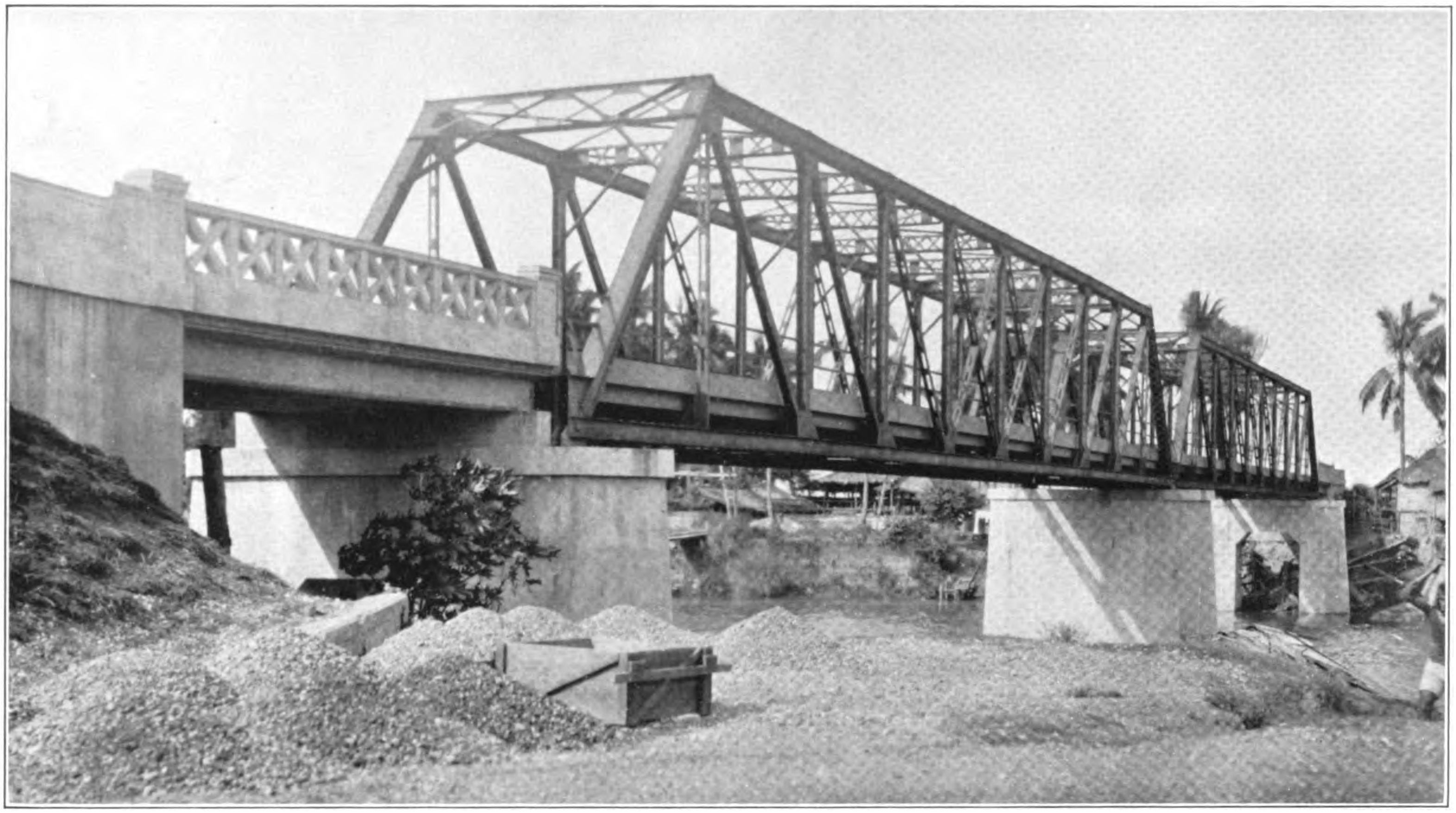
CAVA BRIDGE, LA UNION

TABLE VII.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1928—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1928	Appropriations in 1928	Total expenditure to December 31, 1928	Expenditure in 1928	Work accomplished		Remarks
								To date	During 1928	
		Kms.						*P. ct.*	*P. ct.*	
Cotabato	Lumupog-Bual Road	16.65	₱138,610.00	₱103,692.15	₱42,988.06	₱78,704.79	₱28,001.82	57	20	Grading, surfacing, pipe culverts and temporary bridges.
Do	Cotabato-Lanao Interprovincial Road.	82.75	718,226.00	89,173.55	45.000.00	82,127.59	39,828.62	11	6	Do.
Do	Cotabato-Davao Interprovincial Road.	139.0	1,500,000.00	25,000.00	25.000.00	24,208.85	24,208.85	2	2	Grading and pipe culverts.
Davao	Davao-Cotabato Interprovincial Road.	115.8	1,200,000.00	289,053.32	51,754.67	274,552.42	41,016.95	23	3	Grading, surfacing, pipe culverts and temporary bridges.
Do	Davao-North Road	150.0	....	135,775.66	42,033.12	131,680.25	37,927.71	......	......	Do.
Do	Cuabo-Mati-Boston Road	219.0	2,000,000.00	236,139.99	38,572.09	235.709.99	43.447.74	12	2	Do.
Ilocos Norte	Ilocos Norte-Cagayan Interprovincial Road.	107.0	1,200.000.00	435,577.09	40,000.00	427,831.23	32,516.74	36	3	Grading.
Do	Batac-Banna Road	12.5	90,000.00	26,137.73	5,000.00	26,063.13	14,479.49	29	16	Do.
Do	Batac-Pias Road	4.5	30,000.00	9,104.93	7,000.00	2,618.77	692.58	9	2	Do.
Do	Piddig-Solsona Road	11.0	50,000.00	31,797.52	....	31,309.32	4,637.74	63	9	Grading and pipe culverts.
Do	Pinili-Banna-Nueva Era Road	30.0	300,000.00	45,393.40	13,617.00	41,982.16	10,306.43	4	3	Grading, surfacing and pipe culverts.
Do	Solsona-Kabugao Road	35.0	350,000.00	15,330.59	....	11,778.82	5,773.01	4	2	Grading.
Ilocos Sur	Candon-Bauguen Road	12.4	98,000.00	60,340.19	18,646.00	59,592.45	17,898.26	61	18	Grading and surfacing.
Do	Kabugao-Butac Road	20.0	200,000.00	56,894.55	17,150.00	56,874.68	17,130.18	28	9	Widening and temporary bridge.
Iloilo	Guimbal-Tubungan Road	12.5	75,000.00	18,413.66	4,000.00	18,286.59	3,507.05	24	5	Improvement of present road.
Do	Tigbauan-Cordova-Leon Road	11.9	95,000.00	15,160.64	4,000.00	15,110.65	3,980.55	16	4	Grading and surfacing.
Do	Iloilo-Antique Interprovincial Road.	19.2	400,000.00	358,144.57	20,000.00	357,904.73	21,655.06	90	5	Widening and surfacing.
Do	Janiuay-Lambunao Road	15.0	170,000.00	107,846.13	3,000.00	107,805.47	3,685.74	63	2	Grading and surfacing.
Do	Barotac Nuevo-North Road	56.0	655,000.00	197,233.63	34,000.00	146,823.47	33,533.39	22	5	Grading and surfacing, pipe culverts, and temporary bridges.
Do	Sara-San Dionisio Road	9.3	80,000.00	74,817.12	....	73,856.50	9,520.75	92	12	Surfacing and concrete culverts.
Do	Alimodian-Maasin Road	8.8	50,000.00	19,632.34	18,000.00	12,512.11	10,471.06	25	21	Grading.
Do	San Dionisio-Balasan Road	25.5	257,500.00	71,775.32	30,000.00	71,665.86	29,423.24	28	11	Grading and pipe culverts.
Do	Balasan-Carlos Road	13.2	100,000.00	5,000.00	5,000.00	4,594.55	4,594.55	5	5	Grading.
Do	Muelle Loney Concrete Road	....	65,000.00	61,321.36	4,000.00	59,710.02	22,279.76	92	34	Concrete and asphalt pavement.
Do	Calinog-Capiz Boundary Road	10.90	146,800.00	25,000.00	25,000.00	24,486.70	24,486.70	17	17	Grading.
Do	Zarraga-Beach Road	4.0	25,000.00	4,981.85	4,981.85	4,955.95	4,955.95	20	20	Grading and surfacing.
Do	Lambunao-Calinog Road	6.9	60,000.00	39,460.00	39,460.00	530.04	530.04	......	......	Survey completed.
Do	Asphalt pavement construction	....	75,000.00	70,257.06	23,837.30	70,071.55	26,920.59	93	36	Wharf and Iloilo streets.

TABLE VII.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1928—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1928	Appropriations in 1928	Total expenditure to December 31, 1928	Expenditure in 1928	Work accomplished		Remarks
								To date	During 1928	
		Kms.						*P. ct.*	*P. ct.*	
Iloilo	Santa Barbara–S. Miguel Road	7.7	₱80,000.00	₱20,644.29		₱20,478.46	₱5,140.67	25	6	Grading and surfacing.
Isabela	Cagayan Valley Road	148.9	1,100,000.00	673,707.13	₱176,865.54	673,707.13	184,638.89	61	17	Surfacing.
Do	Echague–Jones Road	20.0	150,000.00	21,162.68	21,162.68	21,122.09	21,122.09	14	14	Grading.
Do	Cauayan–Cabatuan Road	11.5	91,614.00	22,935.79	4,587.16	22,784.44	13,617.65	25	15	Do.
Laguna	Pagsanjan–Luisiana Road	19.0	281,410.00	275,859.90	22,578.00	275,638.84	27,911.61	100	6	Surfacing.
Do	San Pablo–Batangas Boundary	13.0	138,938.00	77,725.75	30,000.00	76,028.70	35,593.23	55	26	Grading, surfacing and temporary structures.
Do	Mabitac–Rizal Boundary Road	12.0	271,503.00	65,664.98	25,000.00	65,562.40	53,481.66	24	20	Grading and temporary bridge.
Do	Mabitac–Santa Maria Road	2.4	28,000.00	19,402.80	12,000.00	18,899.62	11,582.84	67	41	Do.
Do	Biñan Diversion Road	1.74	37,179.00	30,000.00	30,000.00	461.83	461.83			
Do	Santa Cruz–Calauan Road	19.3	120,000.00	13,701.00	13,701.00	13,523.93	13,523.93	11	11	Grading and surfacing.
Do	Pila–Nanhaya Beach Road	4.5	30,000.00	8,200.00	8,200.00	7,390.21	7,390.21	25	25	Grading.
Lanao	Iligan–Misamis Boundary Road	9.7	179,000.00	15,207.67	6,744.00	15,206.66	6,783.35	9	4	Grading, surfacing and concrete culverts.
Do	Lanao–Cotabato Interprovincial Road.	105.0	1,226,000.00	122,986.10	64,821.27	122,863.40	65,468.85	10	5	Grading, surfacing and pipe culverts.
Do	Camp Overton–Kolambugan Road.	39.0	320,000.00	13,603.00	13,603.00	5,754.85	5,754.85	2	2	Grading and temporary bridges.
La Union	Balaoan–Santol Road	10.4	73,745.00	22,279.11	3,630.00	21,866.65	3,222.39	30	4	Surfacing.
Do	Bacnotan–Balaoan Road	15.72	278,525.00	117,992.71	45,378.00	100,541.14	57,133.45	36	21	Grading, surfacing, pipe culverts and temporary structures.
Do	Bacnotan–San Gabriel Road	7.53	214,000.00	10,246.48	1,800.00	10,120.34	2,008.94	5	1	Surfacing.
Do	Tubao–Pugo Road	7.6	170,000.00	7,501.86	250.00	7,489.45	2,914.01	4	2	Grading.
Do	Aringay Diversion Road	3.2	90,274.00	39,748.00	19,748.00	38,685.81	38,685.81	43	43	Grading and surfacing.
Do	La Union–Pangasinan Interprovincial Road.	4.27	134,236.60	15,000.00	15,000.00	7,523.23	7,523.23	6	6	Grading.
Leyte	Baybay–Abuyog Road	51.0	505,490.00	256,395.44	42,000.00	255,793.47	41,632.20	50	8	Grading and temporary bridges.
Do	Maasin–Matalom Road	25.0	240,500.00	217,396.80	39,674.00	217,323.37	41,374.19	89	17	Grading and surfacing.
Do	Dulag–Abuyog Road	24.3	271,500.00	96,847.22	19,674.00	83,358.25	7,014.55	31	3	Do.
Do	Dulag–Mayorga–La Paz Road	6.1	35,000.00	19,514.64	3,000.00	18,432.32	7,410.79	53	21	Surfacing.
Do	Palompon–Valencia Road			23,132.16	20,000.00	7,410.79	5,010.14			Survey.
Do	Baybay–Inopacan Road	24.0	200,000.00	40,582.16	30,000.00	33,754.35	23,178.37	17	12	Grading, surfacing and temporary structures.
Marinduque	Boac–Interior Road	9.5	50,000.00	15,110.00	15,110.00	10,708.16	10,708.16	20	20	Grading and surfacing.
Do	Boac–Diversion Road	1.1	17,000.00	16,370.00	2,000.00	14,669.63	2,663.48	86	16	Do.
Do	Santa Cruz–Torrijos–Malbog Road.	56.8	792,000.00	197,575.42	53,110.00	197,054.35	52,758.12	25	7	Do.
Masbate	Masbate–Milagros Road	30.0	190,561.00	106,318.17	10,829.40	101,146.04	5,657,27	53	3	Road completed with temporary structures.
Do	Masbate–Dimasalang Road			62,348.67	44,457.00	37,393.78	19,502.11			Survey, grading and surfacing.
Do	Aroroy–Milagros Road			10,000.00	10,000.00					Survey.
Do	San Jacinto–San Fernando Road	13.0	159,661.00	57,989.79	25,171.39	50,343.70	17,525.30	32	11	Grading, surfacing and pipe culverts.
Mindoro	Calapan–Pinamalayan Road	68.1	1,391,602.00	435,082.02	31,900.00	432,642.45	33,823.48	31	2	Grading, pipe culverts and temporary bridges.
Do	Jolo–Polo Road	12.2	132,839.00	77,951.53	49,457.90	73,189.43	44,695.80	55	34	Do.
Misamis	Initao–Lanao Boundary Road	25.5	410,000.00	30,110.31		11,453.71	8,419.82	3	2	Grading.
Do	Plaridel–Zamboanga Road	25.22	557,726.00	55,334.27	25,000.00	27,174.56	21,041.96	5	4	Clearing and grading.
Do	Alubijid–Initao Road	25.5	200,000.00	40,130.00	40,130.00	39,919.46	39,919.46	20	20	Grading, surfacing, pipe culverts and temporary bridges.
Do	Misamis–North Road	19.0	150,000.00	80,826.28	53,533.00	39,172.87	11,926.56	26	8	Grading and surfacing.
Do	Talisayan–Agusan Boundary Road.	35.0	400,000.00	41,018.92	31,600.00	36,126.87	28,516.57	9	7	Grading and temporary bridges.
Do	Misamis–Zamboanga Boundary Road.			25,000.00	25,000.00	7,212.43	72,12.43			Survey.
Do	Tagoloan–Talisayan Road	74.8	750,000.00	81,420.05	25,000.00	57,859.58	47,51.64	8	1	Surfacing.
Do	Catarman–Bonbon Road	10.6	100,000.00	19,177.15		14,592.23	53,02.58	15	5	Grading.
Nueva Ecija	Talavera–Licab Road	19.6	165,000.00	156,752.20	13,838.60	156,718.07	141,44.80	95	9	Surfacing.
Do	Nueva Ecija–Nueva Vizcaya Interprovincial Road.	50.8	3,200,000.00	1,461,804.91	70,412.95	1,458,106.12	67,782.17	46	2	Widening and surfacing.
Do	Cabanatuan–Bongabon Road	29.0	200,000.00	185,135.93	46,335.17	178,725.78	41,987.86	100	21	Road completed.
Do	Santa Rosa–Zaragoza Road	15.6	100,000.00	82,922.79	20,645.89	82,918.05	11,733.89	83	12	Surfacing.
Do	San Jose–Lupao–Umingan Road.	16.00	80,000.00	68,964.16	24,995.97	68,964.16	26,117.84	100	30	Road completed.
Do	Cuyapo–Nampicuan Road	6.12	70,000.00	34,860.32	12,381.26	34,855.10	12,376.04	50	18	Surfacing.
Do	Pinagpanaan–Rizal Road	25.72	190,000.00	105,370.18	42,335.18	103,362.94	42,422.41	54	22	Grading and surfacing.
Do	Nueva Ecija–Tayabas Interprovincial Road.	28.3	1,500,000.00	61,107.10	26,458.05	55,872.39	21,298.27	4	1	Do.
Do	Bukot–Zaragoza Road	11.7	95,815.00	68,179.12	20,523.89	68,155.62	20,539.39	71	21	Road completed with temporary structures.
Do	Digdig–Caranglan Road	16.0	150,000.00	16,716.59	3,717.49	16,651.34	3,951.14	11	2	Grading.
Do	Laur Branch Road	9.0	75,000.00	30,576.91	25,408.62	30,463.99	27,406.60	40	36	Grading and surfacing.
Do	Guimba–Tarlac Boundary Road.	8.19	72,000.00	42,330.02	12,754.85	42,328.92	13,713.32	59	19	Road completed with temporary structures.
Do	S. Jose–Rizal Road		120,000.00	2,400.81	2,400.81	2,400.81	2,400.81	20	20	Survey and grading.
Do	Jaen–Carmen Road		30,000.00	5,288.42	5,288.42	5,244.68	5,244.68	18	18	Grading.
Nueva Vizcaya	Bayombong–Santa Fé Road	49.0	490,000.00	249,635.64	56,136.00	240,668.85	56,190.85	49	11	Grading and surfacing.
Do	Bagabag Diversion Road	4.36	50,000.00	30,000.00	30,000.00	29,958.45	29,961.45	60	60	Road completed with temporary structures.
Occidental Negros	Kabankalan–Cauayan Road	20.5	150,000.00	104,519.53	10,000.00	104,132.41	12,953.32	69	9	Surfacing and temporary bridge.
Do	Binalbagan–Isabela Road	14.0	73,000.00	67,415.63	30,000.00	59,508.22	24,703.21	81	34	Grading and surfacing.
Do	Pontevedra–Antipolo Road	10.2	63,000.00	26,700.58	15,000.00	18,531.05	6,894.25	29	11	Do.
Do	Bacolod–Santo Niño Road	1.5	25,000.00	22,106.43	4,000.00	22,074.23	4,183.19	100	20	Road completed.
Do	Sumag–Abuanan Road	11.8	60,000.00	22,257.30	8,000.00	21,979.18	8,219.26	37	14	Grading and pipe culverts.
Do	Occidental Negros–Oriental Negros Interprovincial Road.	34.7	386,000.00	196,347.54	40,000.00	192,860.58	37,991.96	50	10	Grading and surfacing.
Do	La Castellana–Isabela Road	13.0	80,000.00	59,628.14	20,000.00	54,786.41	25,203.17	68	31	Do.
Do	Murcia–Cancilayan Road	6.0	38,000.00	17,141.09		17,089.20	3,953.30	45	10	Do.
Do	Sagay–Vito Road	6.5	35,000.00	22,112.12	11,000.00	21,786.90	10,997.05	62	31	Grading, surfacing and concrete culverts.
Do	N. Estrella–Toboso Road	3.6	23,000.00	10,260.63	4,000.00	10,062.11	5,327.30	44	23	Grading, surfacing and temporary structures.
Do	Murcia–Mambucal Road	13.5	75,000.00	18,040.82	8,000.00	6,094.16	5,353.16	8	7	Grading.
Oriental Negros	Maria–Talingting Road	10.5	50,000.00	10,000.00	10,000.00	9,998.73	9,998.73	20	20	Grading surfacing and pipe culverts.
Do	Lazi–Maria Road	11.1	55,000.00	7,090.00	7,090.00	6,971.73	6,971.73	13	13	Temporary bridges.
Do	Dumaguete–North Road	117.0	600,000.00	554,306.16	63,150.00	538,820.72	47,664.56	90	8	Grading, surfacing, pipe culverts and temporary bridge.
Do	Tanhay–Pamplona Road	7.0	48,000.00	44,092.08	24,087.91	44,092.08	24,087.91	92	50	Grading and surfacing.
Do	Zamboanguita–Siaton Road	20.0	120,000.00	32,744.51	11,581.00	32,685.70	11,548.47	27	10	Grading.
Do	Guihulngan–Occidental Negros Boundary Road.	34.0	204,000.00	106,350.46	30,000.00	106,224.48	29,946.16	52	15	Grading, surfacing, pipe culverts and temporary bridges.
Palawan	Puerto Princesa–Irahuan Road	14.0	142,421.00	68,877.29	33,854.00	59,721.32	24,698.03	47	17	Grading, surfacing and temporary bridges.



Ilog River Bridge, Occidental Negros

TABLE VII.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1928—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1928	Appropriations in 1928	Total expenditure to December 31, 1928	Expenditure in 1928	Work accomplished		Remarks
								To date	During 1928	
		Kms.						*P. ct.*	*P. ct.*	
Pampanga	Concrete Road Pavement	26.8	₱866,000.00	₱866,792.40	₱866,792.40	₱30,016.21	₱30,016.21	4	4	1.01 completed.
Do.	Santa Rita-Porac Road	11.52	150,000.00	48,338.66	20,000.00	37,054.52	30,902.41	25	21	Grading and surfacing.
Do.	Arayat-Magalang Road	9.0	45,000.00	14,636.74	3,000.00	14,635.89	3,068.34	31	7	Do.
Do.	Angeles-Magalang Road	12.2	136,905.00	116,615.28	....	115,990.06	13,488.96	85	10	Do.
Pangasinan	Pangasinan-Zambales Interprovincial Road.	30.0	223,000.00	132,584.82	48,445.56	118,604.92	34,465.66	53	15	Grading and temporary bridges.
Do.	Pangasinan-La Union Interprovincial Road.	10.9	379,000.00	15,005.70	15,005.70	14,996.16	14,996.16	4	4	Grading and surfacing.
Do.	San Carlos-Binmaley Road	13.46	163,000.00	70,490.12	19,713.39	56,703.01	5,926.28	35	35	Do.
Do.	Bani-Bolinao Road	27.0	160,000.00	16,106.00	5,097.07	16,072.17	5,063.24	10	3	Do.
Do.	Malasiqui-Villasis Road	19.86	208,800.00	41,081.86	16,546.94	35,155.07	10,620.15	17	5	Do.
Do.	Binalonan-San Manuel Road	8.0	54,000.00	15,105.48	13,010.84	15,017.50	12,922.86	28	24	Grading, surfacing, concrete culverts and temporary bridges.
Do.	Urdaneta-Manaoag Road	12.0	292,343.00	25,000.00	25,000.00	24,723.48	24,713.48	8	8	Grading and surfacing.
Do.	Carmen-Tarlac Boundary Road.	2.8	31,458.00	27,606.36	16,594.07	27,606.36	16,594.07	100	60	Road completed.
Rizal	Asphalt Road	......	....	95,869.45	20,378.22	95,869.45	21,836.72	....	....	6.5 Kms. completed.
Do.	Taft Avenue Extension Road	3.34	564,087.00	198,083.94	98,050.00	72,377.45	71,760.80	35	35	Grading and surfacing.
Do.	Rizal-Laguna Interprovincial Road.	9.46	168,913.00	67,442.18	25,000.00	62,954.94	20,512.76	37	12	Grading.
Do.	Rizal Avenue Extension Road	3.83	190,000.00	154,248.58	50,000.00	100,815.00	47,578.85	53	25	Grading and surfacing.
Do.	Morong-Santa Teresa Road	7.0	69,321.00	21,482.42	5,000.00	19,818.22	13,335.80	28	19	Do.
Do.	Pililla-Jalaljala Road	16.0	84,046.00	42,089.88	5,000.00	37,964.47	3,144.72	45	4	Do.
Romblon	Carmen-Odiongan-Looc Road	73.6	700,000.00	288,710.72	63,483.50	263,772.43	49,325.12	37	7	Grading, surfacing, pipe culverts and temporary bridges.
Do.	San Fernando-Cajidiocan Road.	17.0	150,000.00	26,865.09	7,758.00	21,129.52	14,716.90	14	10	Do.
Samar	Catbalogan-North Road	88.2	1,168,000.00	711,867.28	93,405.00	710,402.18	91,969.18	61	8	Grading and surfacing.
Do.	Catbalogan-Taft Road	98.0	1,293,000.00	172,461.45	42,080.00	172,513.97	42,419.03	13	3	Do.
Do.	Sulat-Oras Road	45.5	400,000.00	81,821.91	22,200.00	81,811.57	25,104.61	20	6	Do.
Do.	Guiuan-Salcedo Road	17.0	150,000.00	42,501.64	25,570.00	42,367.36	25,442.30	28	17	Do.
Do.	Allen-Mavo Road	9.0	75,000.00	14,148.22	3,211.75	14,132.92	6,203.66	19	8	Do.
Do.	Cabong Diversion Road	2.38	20,000.00	9,479.77	4,200.00	9,473.67	4,391.22	47	22	Do.
Do.	San Miguel-Llorente Road	3.4	20,000.00	5,000.00	5,000.00	4,997.47	4,997.47	25	25	Do.
Do.	Lavezares-Carangian Road	21.3	250,000.00	3,150.00	3,150.00	3,135.81	3,135.81	1	1	Survey and grading.
Do.	San Andres-Samoyao Road	1.84	15,000.00	3,500.00	3,500.20	3,500.20	2,500.20	23	23	Grading.
Do.	Balangiga-Hiporlos Road	7.4	75,000.00	2,900.00	2,900.00	2,899.01	2,899.01	4	4	Do.
Sorsogon	Putiao-Pilar Road	18.6	186,000.00	53,811.00	20,000.00	45,079.05	11,267.62	24	6	Grading and surfacing.
Do.	Bulusan-Irosin Road	16.0	305,535.00	143,090.17	8,000.00	142,557.05	7,485.04	47	2	Surfacing.
Do.	Gate-Matnog Road	17.2	172,000.00	14,006.00	6,000.00	14,005.21	6,818.21	8	4	Grading and temporary bridges.
Do.	Juban-Magallanes Road	24.85	250,000.00	30,000.00	30,000.00	13,242.87	13,242.87	5	5	Grading and concrete culverts.
Do.	Sorsogon-Albay Interprovincial Road.	41.1	1,190,000.00	510,079.47	40,455.60	510,074.30	40,428.91	43	3	Road completed with temporary structures.
Sulu	Jolo-Bud Daho-Romandier Road.	18.1	219,894.00	36,762.78	4,720.82	36,739.10	9,743.04	17	4	Grading and pipe culverts.
Do.	Jolo-Taglibi Road	13.5	194,757.00	8,896.70	14,263.53	48,777.32	18,831.03	25	10	Grading and surfacing.
Do.	Indanan-Silangkan-Parang Road	17.5	203,568.00	22,902.87	4,955.52	22,871.12	4,923.77	11	2	Do.
Do.	Indanan-Parang Road	10.6	100,000.00	16,348.59	4,657.11	16,323.69	4,631.21	16	5	Surfacing.

Insular Psychopathic Hospital, San Felipe Neri, Rizal

TABLE VII.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1928—Continued

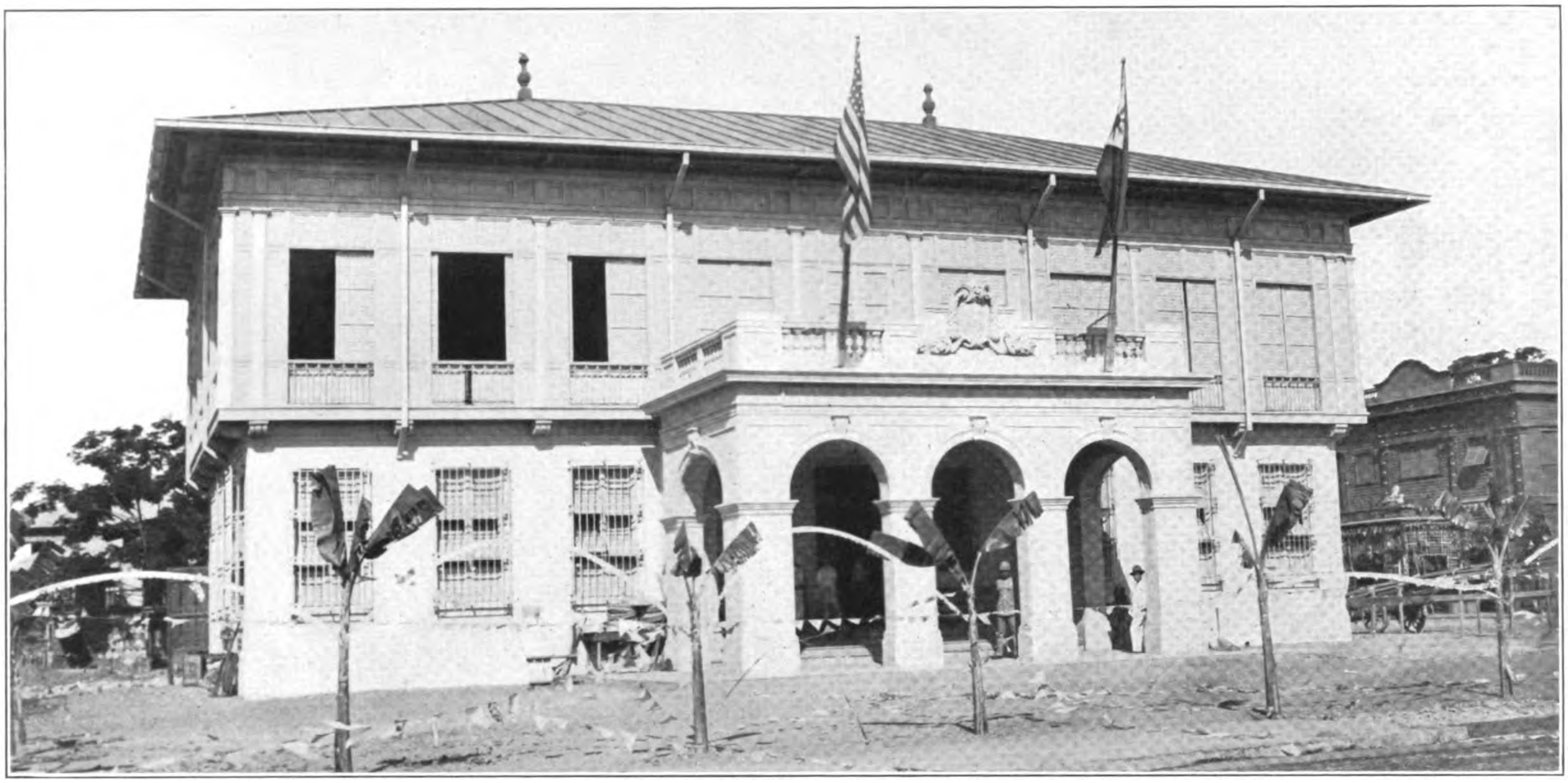
Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1928	Appropriations in 1928	Total expenditure to December 31, 1928	Expenditure in 1928	Work accomplished		Remarks
								To date	During 1928	
		Kms.						*P. ct.*	*P. ct.*	
Sulu	Jolo–Bato Bato–Silangkan Road	15.5	₱170.000.00	₱8,893.86	₱8,487.65	₱8,893.86	₱8,487.65	5	5	Grading.
Do	Jolo–Tandu Batu Road	35.0	211,493.00	51,435.34	51,435.24	26,073.40	26,073.40	12	12	Grading and surfacing.
Surigao	Placer–Gigaquit Road	25.3	250,000.00	170,387.46	64,534.00	170,376.45	65,122.79	68	26	Grading, surfacing, pipe culvert and temporary bridges.
Do	Carrascal-Cantilan–Lanuza Road	30.36	1,067,500.00	102 678.70	32.000.00	101,912.39	31,750.36	10	3	Do.
Tarlac	Tarlac–Camiling Road	21.75	147,000.00	150,989.55	37,880.00	141,045.47	48,964.45	96	33	Grading, surfacing, pipe culverts and temporary bridges.
Do	San Manuel–Carmen Road	9.79	101,458.00	87,137.69	45,000.00	77,189.64	37,853.53	76	37	Grading and surfacing.
Tayabas	Tayabas–Nueva Ecija Interprovincial Road.	74.0	2,000,000.00	65,929.43	20,954.19	62,804.08	17,334.44	3	1	Grading.
Do	Lucban-Sampaloc-Mauban Road	30	569,476.00	495,042.69	58,354.00	481,104.07	44,415.38	85	8	Surfacing.
Do	Infanta–Puerto Real Road	11.0	175,499.00	45,313.67	14,354.00	43,977.18	13,017.51	25	7	Grading and pipe culvert.
Do	Gumaca–Pitogo Road	24.6	410,757.00	155,579.54	52,511.23	144,563.89	41,495.58	35	10	Grading.
Do	Lucena–Dalahican Road	5.5	59,490.00	14,264.24	6,000.00	11,628.30	3,364.06	20	6	Do.
Do	Tayabas–Camarines Norte Interprovincial Road.	62.6	967,000.00	77,119.53	26,950.00	75,195.58	30,331.96	8	3	Do.
Do	Tayabas–Pagbilao Road	11.9	100,000.00	10,245.67	2 000.00	9,906.00	5,442.90	10	5	Survey.
Do	Panaon–Talaba Road	....	....	13,112.64	10,000.00	3,601.53	1,555.23	....	....	
Zambales	Palauig–Masinloc Road	19.6	191,000.00	91 872.00	40,703.00	91.813.10	40,667.40	48	21	Grading and surfacing.
Do	Zambales–Bataan Interprovincial Road.	22.2	1,292,000.00	152,912.00	30,000.00	152,894.07	29,982.99	12	2	Do.
Do	Cabangan–San Narciso Road	16.7	144,000.00	108,179.72	40.477.09	94,045.93	27,366.83	65	19	Surfacing and temporary bridges.
Do	Botolan–Binuclutan Road	9.2	50,000.00	48,629.01	10,000.00	48 615.01	10,451.74	100	31	Surfacing and overflow bridge.
Do	Candelaria–Pangasinan Boundary Road.	23.4	230,000.00	95,300.00	30,000.00	95,166.41	30,314.71	40	13	Grading and surfacing.
Zamboanga	Dohinob–Sindangan Road	....	....	25,264.41	25,264.41	24,927.11	24,927.11	....	....	Grading and surfacing.
Do	Isabela–Lamitan Road	27.0	280,000.00	43,689.53	17,600.00	41,071.64	21,338.54	15	8	Clearing, grading and temporary bridges.
Do	Dapitan–Misamis Boundary Road.	34.0	350,000.00	56,736.19	25,000.00	56,643.30	25,102.51	16	7	Grading, surfacing and temporary bridges.
Do	Bolong–Curuan Road	15.8	140,000.00	87,866.52	38,906.00	78,792.95	45,220.76	56	32	Grading and surfacing.
Do	Tocuran–Misamis Boundary Road.	....	....	25,000.00	25,000.00	5,888.42	5,888.42	....	....	Survey being made.

BRIDGES

The following are the more important bridges constructed or partially constructed during the year 1928:

Sinalang Bridge, Abra Province.—This bridge is being constructed over the Sinalang River on the interprovincial road connecting the Provinces of Abra and Ilocos Sur. It consists of one 160-foot and two 53-foot steel spans with concrete floor. The substructure, consisting of two concrete abutments with two piers, was 100 per cent completed during 1927. The construction of the superstructure of the bridge under contract is progressing satisfactorily. While only 5 per cent of the work was accomplished on account of the late rainy season, the project will be completed on or before March 31, 1929.

Wahig Bridge, Bohol Province.—This bridge consists of one 130-foot steel truss span with a reinforced concrete floor. The contract for constructing the substructure and the erection of the steel superstructure was let to the Butuan Saw Mill Company, Inc., of Cebu. The furnishing of the superstructure (structural steel) was let to the Atlantic, Gulf and Pacific Company of Manila. The excavation for the abutment and pouring of concrete for the footing on the



Municipal Building, Cabanatuan, Nueva Ecija

Colonia side have been completed. The structural steel has been delivered by the Atlantic Gulf and Pacific Company to the Butuan Saw Mill Co., Inc., in accordance with the contract. At the end of the year, 20 per cent of the work was completed. The work is progressing satisfactorily.

Laboc Bridge, Bohol Province.—This bridge consists of one 80-foot riveted pony steel truss span with concrete abutments and reinforced concrete floor. The construction of the substructure and the erection of the steel was let by contract to Mr. Ignacio Molina of Mabini, Bohol. The furnishing of the structural steel was awarded to the Atlantic Gulf and Pacific Company of Manila. At the end of the year, 47 per cent of the work was finished and it is expected that the project will be completed within the contract time.

Mambog Bridge, Bulacan Province.—The work on this project consisted in replacing the old superstructure of Spanish design with reinforced concrete slab and girder construction.

Atlag Bridge, Bulacan Province.—The work on this project consisted in replacing the old Spanish superstructure with reinforced concrete slab and girder construction.

Marilao Bridge, Bulacan Province.—This bridge, consisting of six 11-meter reinforced concrete slab and girder spans on concrete pile bents, was widened to provide a clear roadway of 5.5 meters, with sidewalks on each side of the bridge.

Cafehan Bridge, Bulacan Province.—This project is an 11-meter reinforced concrete slab and girder bridge. The construction work was let under contract to the International Construction Work, Inc., and was completed and opened to traffic on June 5, 1928.

Tullahan Bridge, Bulacan Province.—Construction work on this project was started in December, 1928. This bridge is on the Polo Diversion Road, over the Tullahan River, which forms the boundary line between the Provinces of Bulacan and Rizal. The structure consists of three 10-meter spans of reinforced concrete slab and girder type, supported on concrete piers and V-abutments with one abutment on wooden foundation piles. Construction work was let under contract to Mr. Marion E. Martin, but later subcontracted to the International Construction Works, Inc. The work is progressing very satisfactorily.

Malinta Bridge, Bulacan Province.—The work on this project consists of placing a new superstructure on the piers and abutments of the old Spanish bridge which spanned the Manila Railroad tracks at barrio Malinta, Polo Diversion Road. Reconstruction includes two end spans of 5 meters each and one 6-meter center span of reinforced concrete slab and girder construction. The concrete caps for the old abutments and piers and the slabs and girders for two spans were completed during the year. The work is being done under contract.

Sibul Bridge, Bulacan Province.—Work on this project was started about the middle of December, 1928. The work consists of adding another span of reinforced concrete slab and girder construction to the old bridge, on the Sibul end.

Bocaue Bridge, Bulacan Province.—The work on this project consisted of widening the roadway, the construction of sidewalks, and the repair of girders where the reinforcing steel had rusted and cracked the concrete. With the completion of this project, and the Bocaue Diversion Road, one of the most dangerous and unsatisfactory sections of the Manila–North Road will be eliminated.

Meycauayan Bridge, Bulacan Province.—This bridge consists of two 120′ steel trusses, on concrete abutments and pier. One abutment on the Meycauayan side, the pier, and one span of steel superstructure were completed. The excavation for the other abutment was ready to receive concrete.

Bunlo Bridge, Bulacan Province. The abutments of an old Spanish structure, which are still in good condition, are being used in the reconstruction work, which consists of placing a standard 12-meter concrete slab and girder superstructure. At the end of the year only 7 per cent of the work was completed, but it is expected that the project will be completed on or about March 31, 1929.

Binakayan Bridge, Cavite Province.—Reconstruction work was done on this project. Formerly this was a 3-span wooden truss bridge resting on two concrete abutments and two pile bents. It has been converted into a six 10-meter reinforced concrete deck girder bridge, by adding three additional bents between the existing bents and abutments. The work was done by contract and was completed on July 19 and opened to traffic on August 29.

Provincial Building, Boac, Marinduque

Noveleta Bridge, Cavite Province.—This project included the erection of one 80′–0″ steel truss, 16′–00″ roadway, with reinforced concrete floor, on an old rubble masonry abutment at one end and on a new concrete abutment at the other end. The work was done by contract.

Medellin Bridge, Cebu Province.—This bridge is of the concrete arch type with a span of 16 meters and was constructed by the Butuan Sawmill, Inc.

Camp No. 8 Bridge, Cebu Province.—This bridge is a 16-meter concrete arch and was constructed at Km. 28.05, Cebu–Toledo Road. The approaches to this bridge have been completed and construction materials requisitioned.

Maragayap Bridge, La Union Province.—This bridge consists of one 160-foot steel thru riveted truss span with reinforced concrete floor and concrete abutments. The construction of the substructure and the erection of the steel superstructure was done by contractor Siochi and the structural steel furnished by Mr. A. G. Yankey. Construction work was started on June 2, 1928, and completed on December 11, 1928.

Cava Bridge, La Union Province.—This project is a concrete deck girder bridge of eight 9.00-meter spans over the Cava River on the Manila–North Road. The contract for this work was awarded to Messrs. H. T. Tukusawa and Ichilu Ito. On account of the difficulties encountered in driving piles and unfavorable weather, the contractors were unable to complete the project within the specified time and an extension of 80 working days was granted to them. At the end of the year the work was progressing satisfactorily and the project will be completed before the end of January, 1929.

Naguilian Bridge, La Union Province.—This is a steel bridge over the Naguilian River at Km. 300.58 of the Bauang–Baguio Road, consisting of three 150-foot spans on concrete cylinder piers, and one concrete abutment on the west end, and a temporary wooden trestle approach, 42.00 meters long, on the east end. The contract for furnishing the superstructure was let to Mr. A. G. Yankey, while the construction of the substructure and the erection of the steel superstructure were let to Mr. Tan Samco. The work is progressing satisfactorily and will be completed during the early part of 1929.

Lumban Bridge, Laguna Province.—The Lumban Bridge consists of three 120-foot steel truss spans, with 16-foot roadway on reinforced concrete abutments and piers. It spans the Lumban River at Lumban on the Pagsanjan–Lumban Road. The construction of the substructure, flooring and erection of the steel superstructure was done by Mr. Melecio Arranz and the steel superstructure was furnished by Mr. A. G. Yankey. This bridge was inaugurated on October 14, 1928.

Mangampon Bridge, Laguna Province.—This is a reinforced concrete arch bridge, 33.20 meters long, with a clear span of 22.00 meters. It is located over the Mangampon River at Km. 89 on the San Pablo–Alaminos Road. This project was completed June 13, 1928.

Malaunod Bridge, Laguna Province.—This bridge is of the reinforced concrete slab and girder type, 11.00 meters span, on reinforced concrete abutments. This bridge is located at Km. 91 of the Manila–South Road and was opened to traffic during the early part of April, 1928.

Pampanga River Bridge, Nueva Ecija Province.—The proceeds from a bond issue in the amount of ₱690,000 were made available for this project. The contract for the construction of the substructure and the erection of the steel superstructure was awarded to Mr. Juan Ferrer and a contract for furnishing the fabricated steel to Mr. A. G. Yankey. The contractor for the substructure having failed to make satisfactory progress, the Government was forced to annul the contract and undertake the work by administration in October, 1928. At the end of the year, the two abutments and three piers were completed. The fourth pier was being constructed and foundation piles were being driven for the fifth. Excavation work was under way on the sixth and seventh piers and one steel span had been erected and two other spans were in the process of being erected. It is expected to complete the project before the next rainy season.

Binituan Bridge, Nueva Ecija Province.—This bridge is a 160-foot steel truss span, on two reinforced concrete abutments with wooden foundation piles. It is located on the Manila–North Road near the municipality of Guimba. The construction of the substructure and the erection of the superstructure is being done under

Standard Plan 10-A School Building, Dagupan, Pangasinan

contract with Messrs. Arranz and Concepcion while the fabricated steel was furnished by Mr. A. G. Yankey. Excavation work was under way on the north abutment and all the steel for the superstructure had been delivered at the site at the end of the year. This project will also be finished before the next rainy season.

Danao Bridge, Occidental Negros.—This bridge consists of six 9-meter spans, reinforced concrete slab and girder type. The contract for this project was awarded to Mr. B. Puentevella and on December 31, 1928, 49 per cent of the work had been completed.

Suay Bridge, Occidental Negros Province.—The construction of this bridge, which is a 150-foot steel span on concrete abutments, was carried out under contract with Mr. A. G. Yankey. The project was completed and opened to traffic before the end of the year.

Ilog Bridge, Occidental Negros Province.—This bridge consists of two 160-foot steel spans and two 9-meter reinforced concrete slab and girder approach spans over the Ilog River. This bridge was also built by contractor A. G. Yankey and was completed on August 4, 1928, and opened to traffic.

Hinigaran Bridge, Occidental Negros Province.—This bridge consists of fifteen 9.00-meter reinforced concrete slab and girder spans, with a roadway of 4.88 meters. The work on this bridge was completed by Mr. A. G. Yankey, contractor, in May, 1928.

Calatrava Bridge, Occidental Negros.—This is a reinforced concrete slab and girder bridge of eight 9.00 meter spans, and is being constructed over the Calatrava River on the Escalante–Calatrava Road. The work was started in August, 1928, by administration, but the completion of same has been delayed on account of the lack of proper equipment, which has been in use on other work.

Talabaan Bridge, Occidental Negros Province.—The contract for the construction of this bridge, consisting of one 120-foot steel span on concrete abutments, was awarded to Mr. Luis B. Puentevella in October, 1928, but very little work had been accomplished at the end of the year.

San Fernando Bridge, Pampanga Province.—This bridge is a 22.00-meter reinforced, concrete arch with timber foundation poles. It has a length of 36.10 meters and a clear roadway of 6.00 meters. The work was started by contract in October, 1927, but the contractor failed to complete the bridge within the contract time and the Provincial Board of Pampanga approved of the annulment of same in November, 1928. The work was practically completed by administration at the end of the year.

San Vicente Bridge, Pangasinan Province.—This bridge was constructed in accordance with a special plan, consisting of two bridges spanning the San Vicente Creek on the boulevard leading to the Provincial Capitol Building. Both bridges rest on timber foundation piles. One bridge was completed in August, 1928, by Contractor Nable and the project as a whole was finished before the end of the year.

Inmanduyan Bridge, Pangasinan Province.—This bridge consists of one 160-foot steel truss with reinforced concrete floor and abutments on timber foundation piles, and was built under contract with Mr. Marion Martin of Manila. The project was completed within the specified time and opened to traffic in May, 1928.

Parua Bridge, Tarlac Province.—This project consists of three 130-foot steel truss spans with reinforced concrete floor, on concrete piers and abutments. The construction of the substructure and the erection of the steel superstructure is being done under contract with Mr. Manuel G. Palma of Manila. The fabricated steel for the superstructure was furnished by Mr. A. G. Yankey. The work is expected to be completed in April, 1929.

Cutcut Bridge, Tarlac Province.—This bridge is located on the Manila–North Road at Km. 11.60. It consists of one 160-foot steel truss span with reinforced concrete floor, on concrete abutments. The contract for the substructure and erection of the steel superstructure was awarded to Messrs. Arranz and Concepcion, while the fabricated steel is being furnished by Mr. A. G. Yankey. Due to the nature of the material encountered during construction it became necessary to revise the original plan for the south abutment by placing this abutment on timber foundation piles, which caused some delay in the completion of the project. At the end of the year 45 per cent of the work had been finished and it is expected that the bridge will be completed in April, 1929.

San Isidro Bridge, Tarlac Province.—This bridge is being constructed at Km. 158.33 of the Manila–Tarlac–North Road. It consists of five 9.00-meter reinforced concrete slab and girder spans on reinforced concrete pile bents. The construction of this bridge was contracted by Mr. Manuel G. Palma. While progress of the work has not been satisfactory, the work should be completed in February, 1929.

Malaking Ilog Bridge, Tayabas Province.—This bridge will span the Malaking Ilog River at Km. 125.290 of Candelaria–Bolbok Road. It will consist of two 100-foot steel spans on two reinforced concrete abutments and one center pier. The construction of the substructure, erection of the steel superstructure, and the construction of the reinforced concrete floor slab, including the painting of the bridge, is being done by Mr. Feliciano Nable, contractor. The Atlantic Gulf and Pacific Company furnished the fabricated steel. This bridge should be completed before the next rainy season.

TABLE VIII.—PERMANENT BRIDGES PARTIALLY OR COMPLETELY CONSTRUCTED DURING THE YEAR 1928

Province	Name	Bridge No.	Type	Span in meters or feet	Roadway in meters or feet	Estimated cost	Total expenditures to date	Expenditures year 1928	Percentage of work done	
									Previously	To date
									Per cent	*Per cent*
Abra	Sinalang	449.3	Steel truss	1-160′ 2-53′	4.88 m.	₱160,000.00	₱142,451.44	₱56,485.27	75	5
Bohol	Loboc	88.46	Pony steel truss	1-80′	16′		31,492.94	31,492.94		47
Do	Wahig	72.6	Steel truss	1-130′	16′		54,406.23	54,406.23		20
Bulacan	Mambog		Concrete slab and girder			5,000.00	4,582.79	4,582.79		100
Do	Atlag		do			5,300.00	5,300.00	5,300.00		100
Do	Marilao	21.8	do	6-11.0 m.		18,500.00	18,493.18	18,493.18		100
Do	Calehan	58.6	do	1-11.0 m.	5.50 m.	6,177.41	6,096.49	6,096.49		100
Do	Tallahan	8.207	do	3-10.0 m.	5.50 m.	35,950.00	33,860.00	33,860.00		50
Do	Malinta	4.70	do	2-5.0 m. 1-6.0 m.	5.50 m.	5,850.00	5,600.00	5,600.00		50
Do	Sibul					13,400.00	6,031.41	6,031.41		20
Do	Bocaue	27.4	do	6-12.0 m.	5.50 m.	18,500.00	18,424.10	18,424.10		100
Do	Meycauayan	18.8	Steel truss	2-120′-0½	16′	48,367.66	47,573.87	47,573.87		55
Do	Bunlo	26.5	Concrete slab and girder	12.0 m.	5.5	20,000.00	17,980.05	17,980.05		7
Cavite	Binakayan	20.5	Steel truss	6-10.0 m.	4.88 m.	25,000.00	25,000.00	25 000.00		100
Do	Noveleta	26.24	do	1-80′	4.88 m.	31 000.00	30,175.13	555.25	40	100
Cebu	Medellin	117.3	Concrete arch	16.0 m.	5.50 m.	25,000.00	24,107.65	201.65		
Do	Camp 8	28.05	do	16.0 m.		12,000.00	7,704.38	5,175.38		
La Union	Maragayap	321.9	Steel truss	1-160′	4.88 m.	71,000,00	68,870.37	68,870.37		100
Do	Cava	281.7	Concrete slab and girder	8-9.0 m.	5.50 m.	49,000.00	45,683.35	45,683.35		70
Do	Naguilian	300.58	Steel truss	3-160′	16′	140,000.00	130,616.15	130,616.15		65
Laguna	Lumban	126.65	do	3-120′	4.88 m.	138,838.28	135,998.18	135,998.18		100
Do	Manganpon	89.0	Concrete arch	22.0 m.	4.88 m.	54,247.72	32,963.04	32,963.04		100
Do	Malaunod	91.0	Concrete slab and girder	1-11.0 m.	4.88 m.	26,163.10	26,050.09	17,785.39	45	100
Nueva Ecija	Pampanga	120.8	Steel truss	13-150′	16′	500,000.00	389,061.90	389 061.90		80
Do	Binituan	155.2	do	1-160′	16′	55,000.00	50,933.34	50,933.24		30
Occidental Negros	Danao	100.7	Concrete slab and girder	6-9.0 m.	4.88 m.	50,000.00	49,844.85	49,844.85		49
Do	Suay	83.5	Steel truss	1-150′	16′	50,000.00	48,538.76	48,538.76		100
Do	Ilog	93.3	do	2-160′	4.88 m.	200,000.00	197,856.86	65,548.13	73.5	100
Do	Hinigaran	58.1	Concrete pile	15-9.0 m.	4.88 m.	140,000.00	137,475.42	19,838.36	88.7	100
Do	Calatrava	132.61	Concrete slab and girder	8-9.0 m.	4.88 m.	50,000.00	25,001.50	25,001.50		25
Do	Talabaan	620.0	Steel truss	1-120′-0½	16′	62,500.00	38,577.67	38,577.67		
Pampanga	San Fernando	72.19	Concrete arch	22.0 m.	6.00 m.	54,000.00	50,232.44	46,009.80	8	91
Pangasinan	San Vicente	256.09	Concrete slab	1-11.0 m.	4.88 m.	39,600.00	41,218.46	41,218.46		100
Do	Inmanduyan	220.16	Steel truss	1-160′	16′	53,700.00	54,153.36	54,153.36		100
Tarlac	Parua	103.57	do	3-130′	4.88 m.	160,000.00	110,968.90	110,968.90		61
Do	Cut-Cut	111.60	do	1-160′	4.88 m.	90,000.00	57,456.95	57,456.95		48.5
Do	San Isidro	158.33	Concrete slab and girder	5-9.0 m.	5.50 m.	35,000.00	30,552.20	30,552.20		58
Tayabas	Malaking Ilog	125.290	Steel truss	2-100′	16′	77,500.00	67,493.30	67,493.30		30

Contagious Disease Ward, San Lazaro Hospital, Manila

BUILDINGS

MANILA

The most important insular buildings completed during 1928 are the following:

Normal Training Department.—This building, which forms part of the Normal School group, is a three-story concrete structure 79.0 by 11.70 meters with a hard-wood sheathed roof, overlaid with galvanized iron and cement tile, containing 32 classrooms and offices. Its construction was undertaken by administration at a total cost of ₱270,000, including surcharges, cost of grading of the surrounding grounds, and the construction of concrete walks.

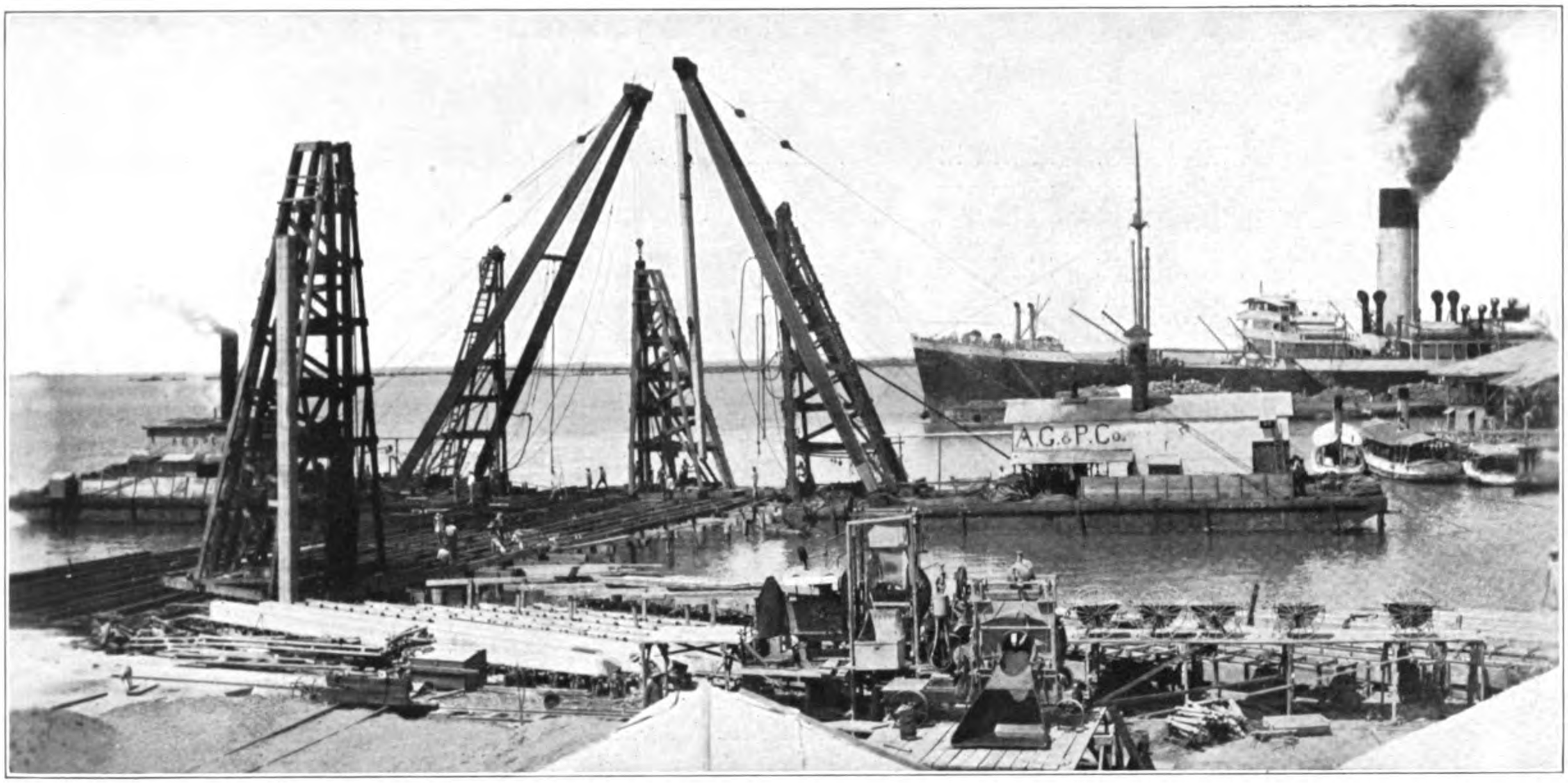
Insular Psychopathic Hospital.—A group of concrete buildings located in San Felipe Neri, Rizal Province, consisting of two wards for male and female patients, one administration building and one kitchen, was constructed by contract for the Insular Psycopathic Hospital. The wards are two-story buildings, 46.8 by 13.0 meters, costing ₱230,054.18. The administration building is a reinforced concrete structure, 57.6 by 14.7 meters, comprising a one-story central unit, with a two-story ell at either end. It houses the administrative offices, a laboratory and operating room, and quarters for some of the nurses and attendants. The cost of this building was ₱106,009.45. The kitchen is one-story concrete building, 20.60 by 20.60 meters, furnished with cooking facilities and providing a large dining room for the staff. Its cost amounted to ₱34,648.07.

Contagious Disease Pavilion.—Two contagious disease pavilions were constructed and completed by contract, one for the General Hospital and another for the San Lazaro Hospital, at a cost of ₱74,517.97 and ₱75,000, respectively. Both are 34.0 by 11.50 meters two-story concrete buildings, roofed with galvanized iron, and contain suitable wards and private rooms for the isolation of contagious disease patients. The only difference is that the San Lazaro building has an operating room, while the General Hospital Pavilion has none.

PROVINCES

During the year the construction of a large number of public buildings was undertaken in the provinces, the most important of which are the following:

Marinduque Capitol Building, Marinduque Province.—This building is similar to the Capitol Building of Negros Oriental, consisting



Cebu Port Works, Cebu, under construction

of a two-story concrete structure 31.0 by 18.0 meters, with four concrete columns in front, which materially add to the appearance of the building. It provides ample rooms for the different provincial offices. The construction of this building was contracted by Mr. Yu Chong Tian of Manila at a cost of ₱95,239. The electrical wiring was undertaken by administration. The total cost of the building amounted to ₱104,973, including the cost of supervision and provincial and insular surcharges.

Cabanatuan Presidencia, Cabanatuan, Nueva Ecija.—This is a special plan prepared by the Central Office for Cabanatuan, consisting of two stories; the first story, which is 22.8 by 12.8 meters, being of concrete and the upper story of wood. It was constructed by Mr. F. Nable, contractor, for the sum of ₱43,830 excluding painting of the concrete. The entire cost of the structure is ₱49,072.30.

Paniqui Presidencia, Tarlac Province.—This building is of the Calbayog type. It is a two-story structure, the first story being of reinforced concrete and the second story of wood. It measures 12.80 by 24.0 meters, and is roofed with galvanized iron. It has sufficient rooms to accommodate all the offices needed by the municipality. The municipal treasurer's office is particularly ample. The construction of this building was undertaken by administration. The work was started in May, 1928, and the building was completed in the early part of December of the same year, at a total cost of ₱38,624.84.

Muñoz Market, Muñoz, Nueva Ecija.—With an available fund of ₱42,851.26, the municipality of Muñoz started the construction of a special type of modern market building, rectangular in shape, 68.8 by 49.80 meters, with an open court in the middle. It is probably the most extensive municipal market building ever designed by the Bureau. The total cost of the building is ₱42,679.07.

TABLE IX.—SCHOOL BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Abra	Lagangilang	Agricultural school	Concrete and wood with G. I. roof (Part of Plan 10-A)	28.5 ×12.25	2,564	₱20,613.28
Do	Bucay	School building	Wood with galvanized iron roof	23.8 × 9.40	1,354	3,563.11
Do	Pidigan	do	Concrete and wood with G. I. roof, Plan No. 4	9.20×32.20	1,776	20,070.24
Agusan	Bunawan	School dormitories	Wood with galvanized iron roof	6×7 2×7 19×7 8×7	2,215.2	23,774.89
Do	Mantangue	Elementary school	do	9.0×18.0	1,192.4	7,000.00
Albay	Daraga	Extension	Concrete and wood with G. I. roof (10-A Type)	11.70× 7.0	567.6	5,715.32
Do	Baras	School building	Wood with G. I. roof semipermanent, No. 10 Type	12.20×14.20	2,973.7	17,458.89
Do	Camalig	do	Concrete and wood with G. I. roof, Plan No. 4	9.20×32.20	1,868.4	17,843.29
Do	Tiwi	do	Wood with G. I. roof, part of Plan No. 10 semipermanent	7.20×11.20	564.48	3,175.59
Do	Libon	do	Concrete and wood with G. I. roof, Plan No. 3 of B. E.	9.20×23.20	1,166.91	12,800.00
Do	Polangui	Domestic Science	Wood with galvanized iron roof	11.20×17.20	1,328.5	10,457.14
Antique	San Jose	High School	Standard Plan No. 10-A. Concrete and wood with G. I. roof.	24.90×51.40	5,927.88	52,399.34
Baguio	Baguio	Shop	Wood with galvanized iron roof	5.0 ×14.5	263.50	2,735.96
Do	Trinidad	Industrial shop	Concrete with galvanized iron roof	17.0 ×39.0	2,928.0	14,039.00
Batangas	Calaca	Central school	Concrete and wood with G. I. roof (Part of 10-A Type)	14.2 ×12.20	1,136.62	10,475.31
Do	Batangas	Central, additional	Wood with galvanized iron roof	21.20×11.20	1,719.81	8,809.76
Do	Santo Tomas	Domestic Science	do	7.0 ×12.50	525.25	4,913.42
Bohol	Talibon	Central school, additional.	Wood with galvanized iron roof	11.0 ×17.5	1,369.18	6,926.70
Do	Sevilla	Central school	do	14.0 ×12.0	1,218.00	7,367.51
Do	Danis	do	Concrete and wood with galvanized iron roof	17.60×14.70 7.00×12.00	2,050.04	14,367.76
Do	Sikatuna	do	Wood with galvanized iron roof (semipermanent)	14.0 ×12.0	1,218.00	7,778.63

TABLE IX.—SCHOOL BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Bulacan	Paombong	Central School	Wood with galvanized iron roof	2-11.5 × 7.0	1,084.33	₱7,301.30
Do.	Pulilan	do.	do.	2-11.5 × 7.0	1,037.19	6,200.00
Do.	Calumpit	do.	Concrete and wood with G. I. roof. Pasig type	27.80×15.90 2-44.40×11.50	9,634.01	85,849.59
Do.	Malolos	High School extension	Wood with galvanized iron roof	4-14.0 ×11.0	2,486.00	9,692.17
Camarines Sur	Pili	Agricultural School	Concrete and wood with galvanized iron roof	14.40×32.40	2,825.00	21,123.39
Do.	Ragay	School building	Wood with galvanized iron roof	12.30×21.10	1,881.00	9,827.39
Do.	Cabusao	do.	Concrete and wood with galvanized iron roof	14.20×11.50	1,071.8	9,366.76
Do.	Cananan	do.	do.	12.0 ×20.80	1,728.5	9,009.59
Do.	Bato	do.	Wood with galvanized iron roof	12 ×21.0	1,827.00	9,781.67
Do.	Pili	do.	Concrete and wood with galvanized iron roof	12 ×21.0	1,776.6	13,819.92
Capiz	Navas	Elementary School	Wood with galvanized iron roof	12.20×14.20	1,404.3	6,328.70
Do.	Pontevedra	do.	do.	9.20×14.20	1,164.7	7,992.67
Do.	Capiz	do.	Concrete and wood with galvanized iron roof	11.80×14.20	1,307.6	7,670.60
Do.	do.	Trade School	do.	12.20×28.20	2,657.33	20,123.29
Cavite	Dasmariñas	Additional to Central School.	Concrete and wood with G. I. roof (2 rooms additional)	16.0 ×11.25	1,211.39	9,921.42
Do.	Indang	Domestic Science	Wood with galvanized iron roof	10.5 × 9.0	566.47	5,444.00
Cebu	Tejero	School	Concrete and wood Plan No. 10 with galvanized iron roof.	24.5 ×50.0	6,680.18	31,546.78
Do.	Dumanjug	Additional School	do.	11.80× 7.0	645.96	12,442.36
Do.	Tudela	do.	Wood with galvanized iron roof	12.0 ×21.0	1,950.4	4,547.02
Davao	Mati	School building	do.	28 ×12	2,382.3	12,097.53
Do.	Davao	Domestic Science	do.	17 ×11	1,309.8	10,424.88
Ilocos Norte	Laoag	High School	Concrete and wood with G. I. roof Plan No. 20	2-49.80×12.40 2-29.00×15.40	4,046.25	93,840.74
Do.	do.	Elementary School	Concrete and wood with G. I. roof. Two-story building.	23.4 ×11.70	3,213.10	28,411.15
Do.	Pinili	School additional	Wood with galvanized iron roof	11.70×17.60	2,645.8	8,496.08
Do.	Solsona	School building	do.	9.0 ×33.0	1,468.80	14,567.96
Do.	Dingras	School additional	Concrete and wood with galvanized iron roof	2-11.70× 7.0	631.7	9,020.24
Ilocos Sur	Santa Cruz	School	Wood with galvanized iron roof	50.20×14.20	4,407.00	25,815.58
Do.	Bantay	do.	Brick and wood (reconstruction)	28.25×17.61	2,954.00	3,977.42
Do.	Candon	do.	Concrete and wood with galvanized iron roof	21.40×12.25 14.40× 9.20	2,673.00	20,516.62
Do.	San Ildefonso	do.	Brick with galvanized iron roof	21.70×18.50	1,919.00	6,167.79
Do.	Caoayan	do.	Wood with galvanized iron roof. Semipermanent	21.15×12.15	1,918.00	10,053.10
Iloilo	La Paz	Domestic Science	Wood with galvanized iron roof	10.0 ×11.0	570.2	2,758.78
Do.	Leganes	School building	Concrete and wood with G. I. roof. Part of Plan 10-A	12 ×21	1,854.6	11,332.35
Do.	Iloilo	Toilet	do.	4.0 × 5.0	113.8	1,456.87
Laguna	Paete	School building	Wood with galvanized iron roof	10.65×20.80	7,340.63	7,092.37
Do.	Cabuyao	School additional	Concrete and wood with galvanized iron roof	9.20×14.40	1,001.67	7,985.59
La Union	San Fernando	Trade School	do.	41.10×10.40	2,924.76	19,684.07
Do.	Luna	Central Annex	Wood with galvanized iron roof	14.10×11.20	157.92	5,962.44
Do.	San Fernando	Trade School Annex	Concrete and wood with galvanized iron roof	28.25×12.25	3,404.67	19,408.89
Leyte	Macrohon	Elementary School	Concrete and wood with G. I. roof. Part of Plan 10-A	21.0 ×12.0	1,595.16	12,199.00
Do.	Caibiran	do.	do.	12.0 ×28.0	2,076.88	15,888.50
Manila	Manila	Teachers' Training School.	Concrete with tile roof	79.00×11.70	17,604.7	270,000.00
Masbate	Milagros	Domestic Science	Wood with galvanized iron roof	7.0 ×12.50	503.56	1,380.19
Do.	Masbate	Central School	do.	11.0 ×24.5	1,736.50	10,629.67
Mindoro	Lubang	do.	Wood with galvanized iron roof	10.50×11.0	743.1	5,246.75
Do.	Calapan	High School	Concrete and wood with G. I. roof (additional rooms)	2-11.80×14.0	1,941.0	14,128.26
Do.	Bongabon	Central School	Wood with galvanized iron roof	9.0 × 9.0	495.32	2,871.64
Misamis	Salay	Elementary School	do.	28.0 ×12.0	2,149.6	14,324.00
Do.	Catarman	do.	Concrete and wood with galvanized iron roof	28.0 ×12.0	2,463.3	19,860.00
Do.	Plaridel	Domesti Science	Wood with galvanized iron roof	9.0 ×16.0	914.90	6,126.00
Do.	Mambajao	do.	Concrete and wood with galvanized iron roof	17.5 ×11.20	1,118.8	10,889.00
Do.	Sagay	School building	Concrete and wood with G. I. roof. Part of Plan 10-A	28.0 ×12.0	2,158.8	18,200.00
Do.	Jimenez	do.	Wood with G. I. roof. (Part of Plan No. 10)	28.0 ×12.0	4,126.5	16,000.00
Nueva Ecija	Zaragoza	do.	Wood with galvanized iron roof	39.2 ×40.40	3,640.00	23,609.44
Do.	Muñoz	Academic building	Concrete and wood with G. I. roof. Plan No. 10-A	50 ×24.50	5,719.84	44,428.69
Occidental Negros	Lalagsan	School building	Wood with galvanized iron roof	14.0 ×12.0	1,104.60	6,879.40
Do.	Cabacuñgan	do.	do.	14.0 ×12.0	1,104.60	7,671.36
Do.	Bulad	do.	do.	14.0 ×12.0	1,104.60	5,363.50
Do.	Ilog	School extension	do.	21.0 ×11.0	1,518.82	7,965.41
Do.	Cauayan	do.	do.	17.5 ×11.0	1,250.60	8,473.85
Do.	Sagay	do.	Concrete and wood with galvanized iron roof	18.0 ×12.25	1,624.40	14,064.51
Do.	Binalbagan	School extension	do.	12.0 × 9.0	680.4	4,359.30
Do.	Cadiz	do.	do.	21.0 ×11.45	1,737.02	10,411.99
Do.	Pulupandan	Domestic Science	Wood with galvanized iron roof	11.0 × 8.00	484.8	....
Do.	La Carlota	School building extension.	Concrete and wood with G. I. roof. Part of Plan No. 20.	28.0 ×11.0	2,213.8	16,565.91
Do.	San Miguel	School building	Wood with galvanized iron roof. Plan No. 10. Semipermanent.	14.0 ×12.0	1,104.6	5,756.19
Do.	Hinigaran	School building extension.	do.	28.0 ×11.0	2,025.22	12,615.12
Do.	Silay	do.	Wood with galvanized iron roof	7.0 ×11.8	594.70	....
Do.	Victorias	Domestic Science	do.	13.36×12.0	680.9	....
Do.	Manapla	do.	do.	13.86×12.0	680.9	....
Do.	Cadiz	School building	Concrete and wood with galvanized iron roof	11.5 ×14.0	1,281.56	....
Oriental Negros	Ayuguitan Nuevos	do.	Wood with galvanized iron roof	28.0 ×12.0	2,479.65	12,633.39
Do.	do.	Domestic Science	Concrete and wood with galvanized iron roof	12.50× 7.00	524.85	11,499.60
Do.	Jimalalud	School building	Concrete and wood with G. I. roof. (6 rooms of Plan No. 10-A).	28.0 ×17.60	4,958.6	28,701.06
Do.	Luzuriaga	do.	Wood with G. I. roof (6 rooms semipermanent)	28.00×17.5	3,890.7	20,315.71
Do.	Dawin	do.	do.	28.00×17.50	3,890.7	20,498.00
Pampanga	Floridablanca	School building	Concrete and wood with G. I. roof. (Part of Plan No. 10-A).	12.275×14.0	1,418.62	9,624.21
Do.	Mexico	School building additional.	do.	11.6 ×28.0	2,245.5	15,777.89
Pangasinan	San Carlos	Farm School dormitory.	Concrete and wood with G. I. roof. Plan No. 6 with one additional.	14.20×32.20 11.70× 7.10	4,242.63	25,639.38
Do.	Pozorrubio	School additional	do.	11.80×35.0	3,322.90	16,934.68
Do.	Dasol	School building	Concrete and wood with G. I. roof. Plan No. 4	9.20×32.20	2,195.55	10,932.02
Do.	Dagupan	do.	Concrete and wood with G. I. roof. Plan No. 10-A	11.25×28.5 11.45×21.20	4,506.4	25,545.12
Do.	Manaoag	School building additional.	Concrete and wood with galvanized iron roof	12.20× 7.00 11.20×14.20	1,817.26	9,627.84

TABLE IX.—SCHOOL BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Pangasinan	Sison	School building	do	9.20×14.20	938.07	₱6,302.07
Do	Asingan	do	Concrete and wood with galvanized iron roof. Plan 10-A.	12.25×28.5	2,426.37	16,583.34
Rizal	Pililla	do	Wood with galvanized iron roof alteration only	36.0 × 9.0	2,268.00	4,300.00
Do	Taguig	do	Wood with galvanized iron roof. (Semipermanent)	32.00× 9.0	2,073.65	8,666.66
Do	Marikina	do	do	18.0 × 9.0	1,113.95	4,500.00
Do	San Juan	do	do	32.0 × 9.0	1,944.05	8,598.20
Do	Makati	do	do	32.0 × 9.0	1,944.05	8,800.00
Do	Antipolo	do	do	32.0 × 9.0	1,944.05	8,350.00
Do	Caloocan	do	Concrete and wood with G. I. roof. Plan No. 4—Bonifacio Memorial.	32.2 × 9.2	2,101.78	14,000.00
Romblon	Corcuera	School building	Wood with G. I. roof. (Semipermanent)	9.0 ×18.0	1,053.0	6,061.01
Samar	Basey	Domestic Science	Wood with galvanized iron roof	15.20× 7.20	578.88	4,638.52
Sorsogon	Irosin	School building	do	12.0 ×28.0	2,385.6	11,333.20
Do	Bulan	School building additional.	Concrete and wood with galvanized iron roof	35.0 ×11.0	2,716.2	21,061.25
Sulu	Parang	School building	Wood with galvanized iron roof	17.84×43.68	5 942.97	21,934.99
Surigao	Loreto	do	Wood with galvanized iron roof. (Semipermanent)	18.0 × 9.0	972.0	8,379.26
Do	Dapa	do	Concrete and wood with G. I. roof. Plan No. 2	14.0 × 9.0	956.0	8,565.68
Do	Surigao	High School additional	Wood with galvanized iron roof. (Semipermanent)	35.0 ×11.0	2,752.0	17,992.41
Tarlac	Victoria	Additional	Concrete and wood with galvanized iron roof	7.0 ×11.80	1,135.05	6,215.22
Do	Moncada	School building	Concrete and wood with G. I. roof. (4 central rooms, Plan 10-A).	12.0 ×28.0	2,151.2	15,256.72
Tarlac	Pura	School building	Concrete and wood with G. I. roof. (4 central rooms, Plan 10-A).	12.0 ×28.0	2,151.20	14,518.77
Do	Capas	Additional	Concrete and wood with G. I. roof. (4 additional rooms, Plan 10-A).	4- 7.0 ×14.0	2,087.46	14,935.86
Do	Tarlac	do	Concrete and wood with G. I. roof. (8 additional rooms, Plan 10-A).	2-11.70×28.0	4,138.80	24,551.10
Tayabas	Polillo	School building	Wood with G. I. roof. Plan No. 4. (Semipermanent)	9.0 ×32.0	1,728.0	10,415.83
Do	Lopez	Additional rooms	Concrete and wood with G. I. roof. Plan No. 15	11.5 ×42.0 12.0 ×21.0	2,996.00	21,684.65
Do	Macalelon	School building	Wood with G. I. roof. (5 rooms of Plan No. 10 Semipermanent).	11.5 ×11.20	2,640.0	17,438.85
Do	Casiguran	do	Wood with G. I. roof. (2 rooms of Plan No. 10 semipermanent).	12.0 ×14.0	1,100.40	7,251.68
Do	Pitogo	Domestic Science	Wood with G. I. roof	7.0 ×12.50	426.56	5,604.73
Do	Tiaong	School additional	Concrete and wood with galvanized iron roof	2(9.20×14.20)	1,731.08	15,217.65
Do	Unisan	Domestic Science	Wood with galvanized iron roof	7.0 ×12.50	426.56	5,990.59
Zambales	San Narciso	Elementary School	Concrete and wood with G. I. roof. Part of Plan 10-A	12.0 ×28.0	2,158.0	13,870.16

TABLE X.—HOSPITALS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cu. meters*	
Albay	Tabaco	Dispensary	Wood with G. I. roof—Stage IV, Philippine Health Service.	9.50×11.50	611.33	₱6,071.90
Do	Bacacay	do	do	9.50× 9.50	730.4	5,130.98
Bulacan	San Miguel	do	Wood with G. I. roof	9.50× 5.50 4.0 × 3.00	273.52	3,842.40
Cotabato	Pikit	Sick ward	do	17.0 ×10.0	1,245.4	2,148.16
Davao	Davao	Contagious pavilion	Wood with tile floor and G. I. roof	23.0 × 9.0	1,456.36	18,600.00
Ilocos Sur	Cervantes	Hospital kitchen	Concrete and wood with G. I. roof	8.53× 4.15	79.00	816.59
Do	do	do	do	8.53× 4.15	125.0	1,913.71
Do	Vigan	Doctor's quarters	Wood with G. I. roof	10.65× 7.15	454.0	7,484.80
Do	do	Nurses' quarters	do	9.15× 7.50	516.0	
Iloilo	Santa Barbara	Lepers' quarters	Bamboo and nipa	7.5 ×18.0	874.5	5,633.83
Do	do	do	do	7.5 ×18.0	874.5	
Do	do	Kitchen	Nipa with concrete floor	7.0 ×18	388.5	
Do	do	Quarters	Bamboo and nipa	6.0 × 6.0	229.0	
Do	do	Guard house	do	6.0 ×12.0	410.00	
Do	do	Treatment building	Concrete and wood with G. I. roof	6.0 × 6.0	124.3	
Do	do	do	Nipa	3.0 ×12.0	124.3	
Do	do	Toilet, men	do	2.0 × 6.0	57.0	
Do	do	Toilet, female	do	2.0 × 6.0	57.0	
Lanao	Iligan	Emergency hospital	Wood with G. I. roof	9.50× 8.0 9.50× 1.5 3.0 × 2.0	494.80	3,614.56
Manila	(San Felipe Neri), Rizal	Insular Asylum wards	Concrete with G. I. roof	2-46.8 ×13.0	13,049.64	230,054.18
Do	do	Kitchen	do	20.60×20.60	1,790.81	34,648.07
Do	Manila	Contagious Pavilion, San Lazaro Hospital.	do	34.0 ×11.50	3,964.5	75,000.00
Do	do	Contagious Pavilion, Philippine General Hospital.	do	34.0 ×11.50	3,964.5	74,517.97
Do	(San Felipe Neri), Rizal	Administration building, Insular Asylum.	do	57.6 ×14.70	6,254.11	106,009.45
Do	do	Mess hall	Concrete and wood with G. I. roof	29.0 ×16.0	2,986.10	20,127.40
Occidental Negros	Bacolod	Doctor's quarters	Wood with G. I. roof	15.5 ×12.5	1,366.45	13,315.75
Do	do	Nurses' quarters	do	19.5 ×12.0	919.20	
Do	do	Puericulture center	Wood with G. I. roof (Extension)	13.1 × 5.5	670.06	15,203.65
Do	Binalbagan	do	Wood with G. I. roof	11.0 × 8.0	745.96	3,893.85
Do	Ilog	Emergency hospital	do	9.5 × 5.5	265.76	3,293.82
Do	Victorias	do	do	9.5 ×11.5	370.47	3,631.27
Do	Sagay	do	do	9.5 × 5.5	265.76	2,690.06
Do	Escalante	do	do	9.5 ×11.5	370.5	4,342.08
Surigao	Surigao	Dispensary	Wood with G. I. roof. Stage Plan No. 4, Philippine Health Service.	9.5 × 9.50	570.0	5,852.49

South Breakwater, Manila Harbor

TABLE XI.—MARKET BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cu. meters*	
Albay	Bato	Market building	Concrete with G. I. roof	18.0 ×26.0	1,893.15	₱11,558.00
Batangas	Taal	Slaughterhouse	do	8.90×12.20	524.76	3,950.00
Bohol	Calape	Market building	do	18.0 ×42.0	5,081.78	17,700.92
Bulacan	Malolos	do	do	48.60×30.60	9,740.0	26,725.32
Do	Hagonoy	do	Concrete with G. I. roof, earth floor	25.00×21.0	3,491.44	9,591.79
Cagayan	Tuguegarao	Tiendas	Concrete with G. I. roof	20.7 × 5.40	574.21	7,858.66
Do	Aparri	do	do	16.65× 5.40	373.3	5,142.38
Camarines Norte	Labo	Market building	do	25.5 ×12.0	2,220.21	9,225.43
Camarines Sur	Naga	Tiendas	do	10.20×20.70	1,027.0	12,072.76
Do	Naga	do	do	10.20× 8.70	416.1	
Do	Nabua	do	do	10.20×28.70	1,433.5	15,219.85
Do	Baao	Market building	do	21.60×36.70	4,141.4	19,386.77
Do	Naga	Tiendas	do	5.10×32.70	782.1	11,326.00
Do	Buhi	Market building	do	24.0 ×39.10	5,577.0	23,954.83
Capiz	Panay	do	do	15.0 ×27.0	2,333.28	12,487.45
Cebu	Consolacion	do	do	18.0 ×34.0	3,555.9	14,523.94
Ilocos Norte	Laoag	Slaughterhouse	Concrete and wood with G. I. roof	12.0 ×25.0	1,175.90	11,982.39
Iloilo	Calinog	Market building	Concrete with G. I. roof	12.0 ×34.50	1,508.5	13,152.65
Laguna	Luisiana	do	do	18.0 ×42.0	4,006.8	10,500.00
Lanao	Momungan	do	Concrete with G. I. roof, with earth flooring	23.58×10.74	1,042.89	1,199.18
Do	Kolambugan	Market extension	Concrete with G. I. roof	9.99×10.74	455.72	1,504.16
Nueva Ecija	Cabanatuan	Market building	Concrete with G. I. roof	18 ×42	3,317.50	15,891.67
Do	San Jose	do	do	15.0 ×27.0	1,640.47	8,460.14
Do	Muñoz	do	Concrete and wood with G. I. roof	49.80×68.80	4,762.96	42,679.07
Occidental Negros	Valladolid	do	Concrete with G. I. roof	15.6 ×27.6	1,825.6	
Do	Manapla	do	do	21.0 ×36.1	3,283.2	16,984.04
Do	Sagay	do	do	15.6 ×27.6	1,825.6	....
Oriental Negros	Sibulan	do	do	18.0 × 9.0	1,294.7	4,020.00
Do	Ayuguitan Nuevo	do	do	22.50× 9.0	1,592.8	9,477.00
Do	Ayuguitan Viejo	do	do	18.0 × 9.0	1,294.7	
Pampanga	San Fernando	do	do	18.0 ×30.0	3,050.0	12,119.74
Do	San Simon	do	do	12.0 ×21.0	1,350.0	6,410.34
Pangasinan	Santa Barbara	do	do	21 ×28.70	3,125.3	14,182.39
Do	Malasiqui	do	Concrete with G. I. roof— Two units	21.0 ×43.50	5,192.3	40,130.49
Do	Mangaldan	do	Concrete and wood with G. I. roof	(6.0 ×32.8)	1,790.4	14,585.72
Do	do	Matadero	Concrete with G. I. roof	(8.90×12.20)		
Do	do	Outhouse	Wood with G. I. roof	(2.20× 5.60)		
Rizal	Pasay	Market building	Concrete with G. I. roof	15.0 ×35.0	3,652.50	8,897.09
Sorsogon	Sorsogon	do	do	36.10×21.0	5,325.65	
Do	do	Tiendas	do	6- 6.0 × 6.0 5- 4.0 × 6.0	650.08	39,135.86
Do	do	do	do	3- 4.0 × 6.0 4- 6.0 × 6.0	486.84	
Do	Juban	Market building	do	36.10×21.0	5,325.65	16,336.27
Do	Bulusan	do	do	30.0 ×12.0	1,836.0	7,951.34
Tayabas	Candelaria	do	do	21.0 ×43.5	5,389.65	20,474.80

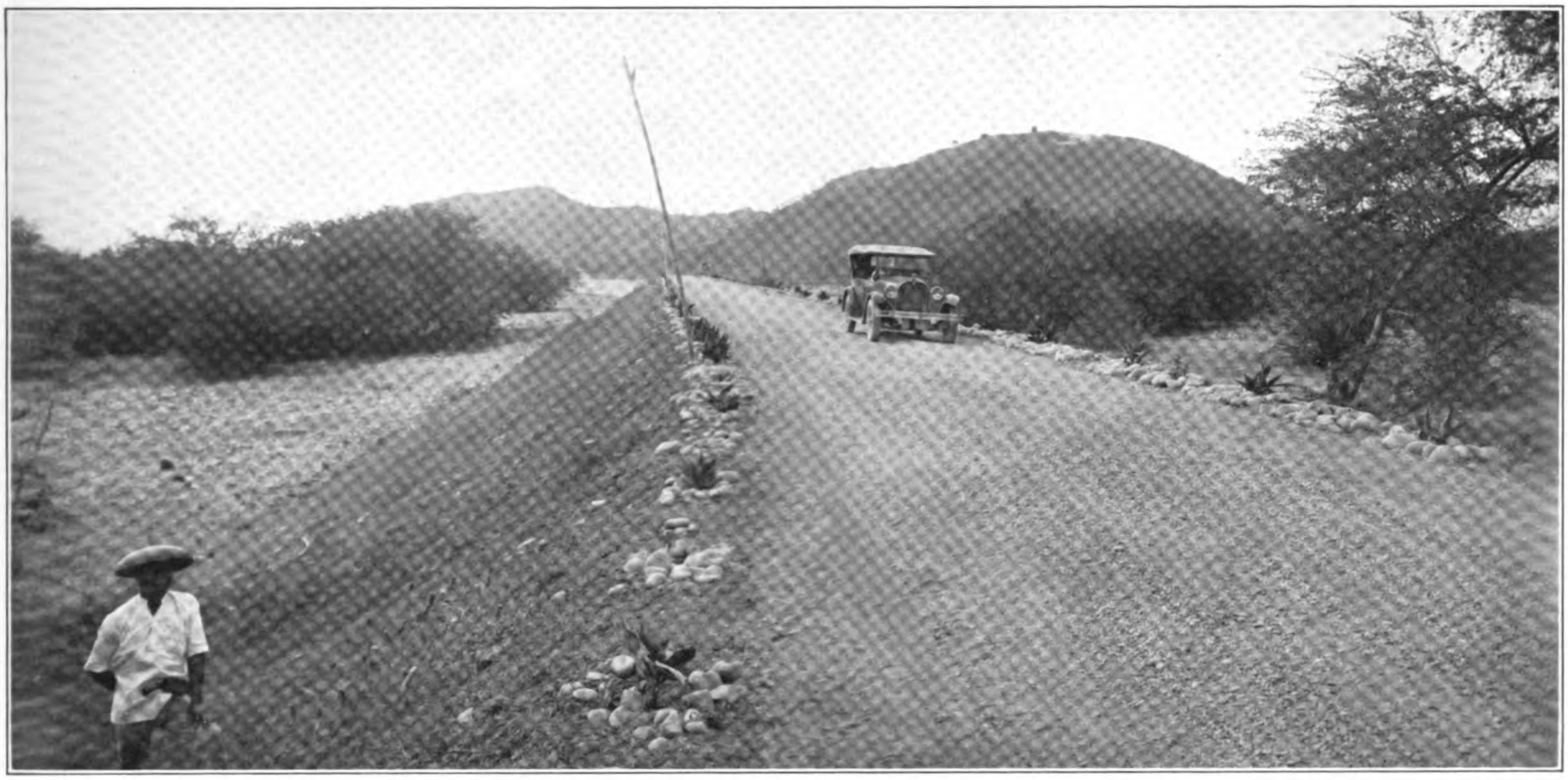
San Jose de Buenavista Wharf, Antique

TABLE XII.—PRESIDENCIA BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cu. meters*	
Albay	Rapu-rapu	1	Wood with G. I. roof (Muntinlupa Type)	7.20×14.20	669.7	₱9,212.13
Do	Libon	1	Wood with G. I. roof (Clarin Type, modified)	8.20×13.20	998.13	14,707.91
Do	Oas	1	Wood with G. I. roof (San Jose Type, modified)	9.10×17.10	1,376.24	17,643.80
Bohol	Duero	1	Wood with G. I. roof (San Jose Type)	17.10× 9.10	1,787.82	14,191.89
Capiz	Pilar	1	.....do	17.10× 9.10	1,382.00	15,908.10
Cavite	Bacoor	1	.....do	17.10× 9.10	1,480.14	18,440.00
Isabela	Gamu	1	Wood with G. I. roof (Clarin Type)	8.2 ×13.2	845.0	12,715.98
Laguna	Alaminos	1	.....do	9.90×12.0	988.16	12,059.64
Do	Los Baños	1	.....do	9.90×12.0	988.16	10,666.80
Leyte	Burauen	1	Concrete and wood with G. I. roof (Calbayog Type)	26.0 ×14.8	3,055.9	43,569.76
Nueva Ecija	Cabanatuan	1	Concrete and wood with plain G. I. roof	12.80×22.80	3,705.07	49,072.30
Pampanga	Macabebe	1	Concrete and wood with G. I. roof (Magalang Type) (Special).	8.60×18.30	2,083.37	26,591.87
Pangasinan	Balincaguir	1	Wood with G. I. roof (Clarin Type) part of materials donated.	13.20× 0.20	1,036.31	4,902.22
Rizal	Taguig	1	Wood with G. I. roof (Clarin Type)	13.2 × 8.2	900.39	8,800.00
Sorsogon	Bulusan	1	Wood with G. I. roof (Clarin type) semi-permanent building.	8.7 ×13.7	845.01	10,158.76
Occidental Negros	Escalante	1	Wood with G. I. roof (San Jose type) semi-permanent building.	16.1 × 8.1	1,319.28	11,540.27
Tarlac	Santa Ignacia	1	Wood with G. I. roof (Clarin Type)	6.80×11.80	819.30	10,507.16
Do	Mayantoc	1	Sawale and wood with galvanized iron roof	6.80×11.80	819.30	7,687.62
Do	Paniqui	1	Concrete and wood with G. I. roof (Calbayog Type)	13.0 ×24.20	3,906.7	38,624.84

TABLE XIII.—MISCELLANEOUS BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cu. meters*	
Albay	Tabaco	Midden shed	Wood with G. I. roof	2.50× 5.0	42.51	₱1,537.47
Baguio	Baguio	Girls dormitory	.....do	13.0 ×36.0	4,784	31,000.00
Do	.....do	Children's play hall	.....do	8.0 ×12.0	480	4,578.00
Do	.....do	Auto shed	Wood with G. I. roof (temporary)	5.0 ×14.5	224.75	1,272.62
Do	Trinidad	Boys' dormitory	Wood with G. I. roof	13.5 ×36.0	3,402	12,115.15
Batanes	Basco	Radio employees' quarters.	Concrete with concrete roof	18.30×24.41 6.35× 4.41 3.175× 4.41	417.8 139.9 67.4	22,935.78
Do	.....do	Kitchen	Rubble masonry with G. I. roof	6-10 5.10	152.44	
Do	.....do	.....do	.....do	6.10× 5.10	152.44	
Batangas	Batangas	Electric plant annex	Galvanized Iron with G. I. roof	7.0 ×16.30	656.07	4,192.53
Bohol	Dauis	Magazine for explosives.	Adobe with cement tile roof	3.0 × 3.66	53.24	1,325.13
Marinduque	Boac	Capitol building	Concrete structure (Dumaguete Type)	18.00×31.00	6,893.00	104,973.00
Nueva Vizcaya	Bayombong	Farm School granary	Concrete and flat G. I. with G. I. roof	7.0 ×14.0	392.0	2,600.00
Occidental Negros	Bacolod	Magazine for explosives.	Concrete with G. I. roof	4.75× 5.47	77.08	1,297.45



Amburayan River Causeway, La Union

ARTESIAN WELLS

With an insular appropriation of ₱250,000 as aid for the drilling of artesian wells during 1928, it was possible to keep only 14 drilling machines in active operation out of the 30 that are owned by the Insular Government. Ninety-three public wells, with an aggregate depth of 33,909 feet were drilled, 90 of which were successful and 3 unsuccessful. In addition to the above, two private wells were drilled, one for the Philippines Cold Stores, Manila, and the other for the Cañacao Hospital, U. S. Navy, the total cost of which was paid by the parties concerned.

At the close of the year, proper resolutions were on hand from 112 municipalities, requesting the drilling of 254 wells and guaranteeing the one-third cost of successful wells as required under the provisions of annual appropriation acts for many years. A substantial increase in the annual insular appropriation will be necessary to take care of the increasing number of requests for the drilling of artesian wells.

From 1904 to 1928 the Bureau of Public Works drilled a total of 2,034 successful public and private wells capable of supplying a total of 49,248,580 gallons of potable water per 12-hour day, which, at the rate of 20 gallons per capita, can provide a water supply for 2,462,429 people.

FUNDS EXPENDED

	1927		1928	
		Per cent		*Per cent*
Successful wells	₱296,291.63	97	₱239,188.39	94
Unsuccessful wells	8,654.36	3	14,925.38	6
Total	304,945.99	100	254,113.77	100

Geological surveys and investigations were made by the Bureau of Science to determine the feasibility of drilling artesian wells on the coastal plain of the Ilocos region, comprising the Provinces of La Union, Ilocos Sur, and Ilocos Norte, also in Cebu Province and in the vicinity of Pateros, Rizal Province, for which work the amount of ₱4,000 was allotted from the 1928 appropriation for artesian wells.

COMPARATIVE COST OF DRILLING

	1927	1928	Increase + Decrease —
A. Unsuccessful wells included:			
Per meter	₱25.50	₱24.58	— ₱0.92
Per foot	7.77	7.49	— .28
B. Not including unsuccessful wells:			
Per meter	26.12	24.21	— 1.91
Per foot	7.96	7.38	— .58

SUMMARY OF DEEP WELL DRILLING

	No. of wells drilled		Total depth in meters		Total flow in liters per minute	
	1927	1928	1927	1928	1927	1928
Successful:						
Flowing	51	27	6,495	3,447	6,712	8,476
Pumping	73	63	4,849	6,431	8,036	8,002
Total	124	90	11,344	9,878	14,748	16.478
Unsuccessful	4	3	613	457		
Grand total	128	93	11,957	10,335	14,748	16,478

DRILLING MACHINES OPERATED BY BUREAU OF PUBLIC WORKS

Type of machine	In field	Stored at Pipe Bodega and Property Division	Stored in the provinces	Total
Cyclone (belongs to the Province of Bulacan)	1			1
Star		3	1	4
Standard		1		1
Columbia No. 3	10	3	1	14
Columbia No. 5	5		2	7
Columbia No. 10		3		3
Total	16	10	4	30

BUREAU OF PUBLIC WORKS MACHINE SHOPS

The activities of the Machine Shop during the years 1927 and 1928, respectively, are shown in the following table:

Year	Number of personnel	Work orders completed	Cost of material	Cost of labor	Total value of work
1927	78	779	₱56,393.25	₱54,096.58	₱110,489.83
1928	76	1,026	51,606.70	52,055.07	103,661.77

In accordance with an agreement with the City of Manila, the Machine Shop is responsible for the maintenance and repair of the artesian wells in the City of Manila, for which work the sum of ₱2,000 was available during 1928.

DESIGNING DIVISION

J. C. COOKINGHAM, *Acting Chief Designing Engineer*

The past year has been an extremely active one for the Designing Division, due to the large amount of loan and bond issue funds available for public works, in addition to the regular appropriations. The resignation of the Chief Designing Engineer left the division short-handed, and repeated attempts to secure additional experienced personnel proved fruitless. Notwithstanding this handicap, designs for an unusually large number of bridge and port works projects were completed, and the work advertised. Noteworthy among the plans completed during the year, are those for the Iloilo Marginal Wharf and Cebu Pier and Marginal Wharf which are the largest port structures of their kind undertaken in the Philippines, outside of Manila. These two projects are being financed from bond issue funds and will involve a total expenditure of approximately ₱3,000,000.

Plans and specifications were prepared for the installation of crude oil engine driven auxiliary generating units for the Zamboanga and the Baguio hydroelectric systems. Both projects have proved to be very profitable, and the business in each case continues to grow. It therefore became necessary to provide additional power to carry the peak loads.

The five bureau-owned calyx core drill outfits were kept in continuous operation on the investigation of subsoil conditions for bridges, wharves and other projects. Fifty subsoil investigations were completed, which is an increase of 50 per cent over the number of investigations made during the preceding year. Of the three cement gun outfits owned by the Bureau, one was permanently assigned to Manila for use on the Manila port structures. The second outfit was used continuously throughout the year in the Province of Cebu, while the third outfit has been employed on numerous bridge and wharf repair jobs in the Provinces of Leyte, Bulacan, and Occidental Negros.

Since Apo cement, manufactured at the Government-owned plant at Naga, Cebu, must be used when available, on all Government construction work, a policy was inaugurated during the early part of the year which permitted contractors on Government projects to purchase tested Apo cement from the Bureau of Supply. This has lowered, to some extent, the number of cement tests handled by the division, although the total number of cement tests made on cement for use on Government construction works shows a substantial increase over the number of tests made during the preceding year. Apo cement has continued to show excellent results in all tests. Not a single sample tested throughout the year failed to meet Government specifications. The following tests on concrete and concrete materials were made during the year.

Total tests on cement from Bureau of Public Works and Bureau of Supply (1/10 barrels tested)	17,261
Total tests on concrete	7,540
Total tests on sand	52
Total tests on gravel	25

Investigation of 1,033 foreshore lease and land sales applications were made for the Bureau of Lands, an increase of 15 per cent over the number made during the year 1927.

Butuan Wharf, Butuan, Agusan

Plans, specifications, and estimates for projects covering bridges, port works, wiring of public buildings for electric lighting, pumping and power plants and other structures, as well as the more important activities of this division in the field, covering investigations, inspections, surveys, operation of cement gun, sand blast and calyx core drill outfits, installations and construction are listed in Tables A, B, C, D, E, F, G, H, I, and J. Throughout the year the personnel of this division made numerous and varied miscellaneous time-consuming studies, technical consultations, preparation and correction of civil service examinations for civil, electrical and mechanical engineers and miscellaneous investigations and reports, in addition to those listed in the tables.

PORT WORKS CONSTRUCTION AND MAINTENANCE

The work accomplished on the more important port works projects is as follows:

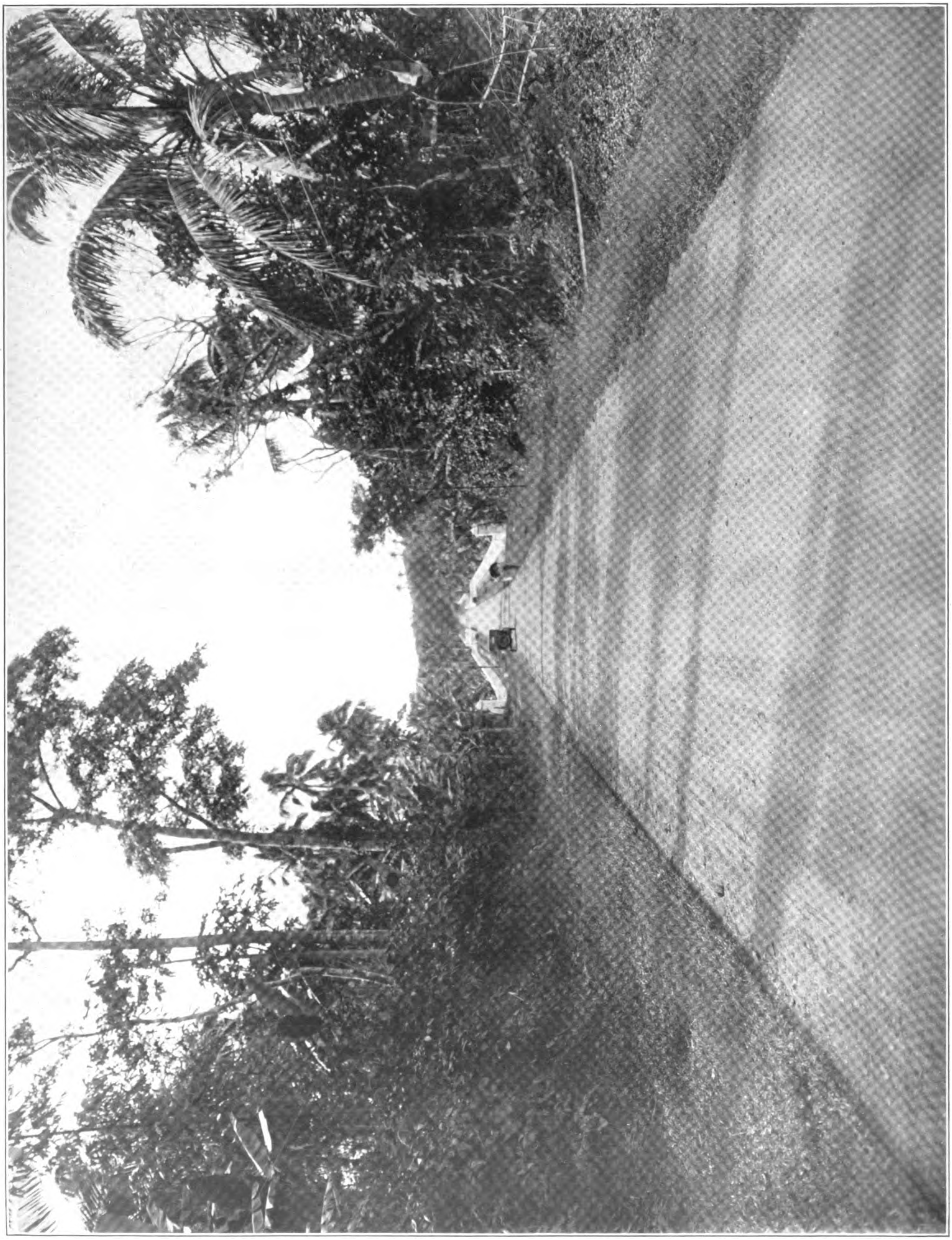
Butuan, Agusan.—A reinforced concrete pile and girder wharf with timber deck, 9.5 meters in width and 22.7 meters in length, was completed by administration at Butuan. This wharf, which is located on the Agusan River about 7 kilometers from its mouth, will accommodate vessels of 14-foot draft, but owing to the bar at the mouth of the river, it is seldom that vessels of more than 10-foot draft can enter the river. For this reason, it is proposed to investigate the natural harbor at Nasipit with the idea of eventually developing this port for interisland shipping.

Legaspi, Albay.—An investigation and survey was made at the Port of Legaspi and preliminary layout plans prepared for the development of the port. The proposed work will include the diversion of the Tibu River, the construction of a reinforced concrete pier and rock breakwater, the dredging of a protected basin for small boats and reclamation of approximately 400,000 square meters of valuable land. This work is estimated to cost approximately one million pesos.

San Jose, Antique.—A reinforced concrete wharf with wooden deck 9.5 meters in width and 22.7 meters in length and a rock causeway approach 200 meters in length, were completed at San Jose. The wharf will accommodate vessels of 20-foot draft. As the only bid received for the construction of this wharf was considered excessive, the work was undertaken by administration and completed within the Bureau's estimate.

Tagbilaran, Bohol.—The construction of a concrete pile and girder wharf, 9.3 meters in width and 21.4 meters in length, which was undertaken by administration in 1927, was completed during the early part of 1928.

Aparri, Cagayan.—Plans and specifications were prepared for a reinforced concrete pile and pre-cast slab jetty at Aparri to prevent the formation of sand bars at the mouth of the Cagayan River. The work was advertised during the early part of the year, but the only bid received was considered so excessive that the work was eventually awarded in May to Contractor C. Russell on a cost plus 15 per cent basis. Actual construction work was started in October, as soon as weather conditions would permit. In November, a most unusual flood occurred in the Cagayan River which caused



LIGAO-GUINOBATAN ROAD, ALBAY, SHOWING OLD SPANISH BRIDGE unprecedented scour during the period of low tide and unfortunately undermined the 50 linear meters of jetty which had been completed. Most of the concrete piles and slabs together with some of the equipment lost, have, however, been recovered and it is proposed to continue the construction on a new location which will be protected from future scour of this nature by permeable dikes on the east bank of the river.

Capiz, Capiz.—Work on the Capiz South Breakwater was continued throughout the year under contract with Mr. Gregorio Yotoko. Work on the North Breakwater was started by administration and continued until October when lack of funds necessitated the shutdown of work until the release of the 1929 appropriations. On December 31, a total of 851 linear meters of the South Breakwater and 116 linear meters of the North Breakwater has been completed, leaving approximately 275 linear meters of the South Breakwater and 150 linear meters of the North Breakwater yet to complete. Work on the breakwaters will be continued during the coming year.

Cebu, Cebu.—Dredging along the Cebu Waterfront was continued throughout the greater part of the year and the dredged materials deposited in the reclamation area.

A length of 407 linear meters of reinforced concrete marginal wharf, 8 meters in width, located in front of the Cebu reclamation area, was completed under contract by the Atlantic, Gulf & Pacific Company.

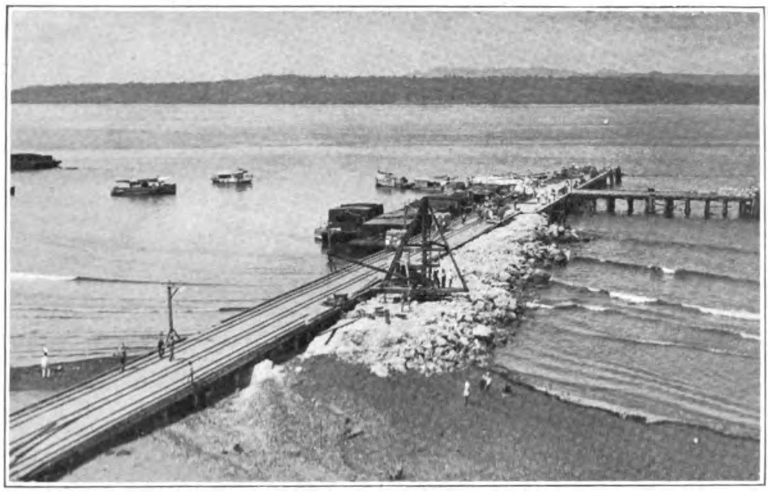
Plans and specifications were completed for 203 linear meters of reinforced concrete marginal wharf, 16 meters in width, and for a reinforced concrete pier 155.5 meters long and 33.3 meters wide. Bids for these two structures were called for on November 15, 1928, and the contract for the construction of both the marginal wharf and pier, was awarded to the Atlantic, Gulf & Pacific Company on December 27, 1928, for the sum of ₱1,111,650. This work is being financed from the 4,000,000-peso bond issue authorized for the improvement of the Port of Cebu. With the completion of this work in 1930, the present congested condition of shipping at the Port of Cebu will be greatly relieved.

Cotabato, Cotabato.—Forty linear meters of gravity type concrete river wall was completed at Cotabato. This wall provides wharfage space for small vessels which enter the Cotabato River. As no bids were received, the work was undertaken by administration.

Davao, Davao.—A reinforced concrete pier 100 meters in length and 9 meters in width was completed under contract by Contractor C. V. Powers in October, 1928. A contract was awarded the Luzon Stevedoring Company for placing 6,000 cubic meters of rock in the causeway approach to the pier, at a unit price of ₱5 per cubic meter. Due to the difficulties experienced in the shipment of dynamite, the contractor was unable to open a quarry until late in the year so that only approximately 100 cubic meters of rock were delivered. The work should, however, now progress very rapidly. With the funds appropriated in 1929 Budget, it is expected to complete the entire 120 linear meters of causeway. The causeway will have a clear width of roadway of 15 meters.

Iloilo, Iloilo.—During March, Contractor J. W. Ford completed his contract for the construction of 115.5 linear meters of concrete gravity wall, which closes the former gap in the river wall below the Iloilo Customs House. The wall was designed for a depth of 18 feet of water and furnishes additional berthing space for interisland vessels in the upper reach of the river.

Because of the slowness with which rock deliveries were being made, it became necessary during the first part of the year to take over the contract originally awarded in 1926 to Messrs. George G. Martin, William Werry, and S. Conway for the delivery of 25,000 metric tons of derrick rock for the jetties at the mouth of the Iloilo River and 12,500 metric tons of derrick rock for the Iloilo Spur Dikes. In July, contract for the delivery of the remainder of the rock was assigned to the Visayan Stevedoring Transportation Company at the original contract price of ₱3 per metric ton of rock in place. By the end of the year, this Company had placed 9,584 tons of rock in the jetties and 1,777 tons of rock in the spur dikes.



Davao Pier, under construction

The construction of 1,042 linear meters of reinforced concrete marginal wharf in the Iloilo River was advertised in September, and in November, the award of the contract to Tan C. Tee & Company, the lowest bidder, was recommended. Owing to the failure of the Insular Auditor to furnish a certificate of funds, the award of the contract had not been effected by the end of the year. The contractor has, however, started the collection of materials and equipment at the site. The upstream portion of this wharf for a distance of 264 meters, has a width of 8 meters and is designed to accommodate vessels of 18-foot draft. The remaining 778 linear meters of wharf is 11 meters wide and is designed to permit of dredging to a depth of 30 feet. The dredging of the river will be undertaken during the coming year so that with the completion of the wharf, over-seas vessels will be able to enter the river and dock along side. It is also proposed to undertake the construction of a marginal wharf in the straits, outside the river mouth, in the immediate future.

Iligan, Lanao.—Owing to the limited funds available and the fact that there are no local contractors in Lanao with experience in port construction work, authority was obtained to undertake the construction of the Iligan Pier by administration. The plans for this project include a rock causeway approach 96 meters long and 6 meters wide and a reinforced concrete pier 63 meters long and 12 meters wide. At the end of the year, the causeway approach had been completed and 42 concrete piles cast. It is proposed to continue this work with the ₱25,000 appropriation carried in the 1929 Public Works Act.

Tacloban, Leyte.—The construction of a reinforced concrete wharf extension to the present wharf at Tacloban was undertaken by administration during the year. At the end of the year, all the concrete piles had been driven and the forms for the greater part of the concrete deck had been placed. It is proposed to continue the extension of the wharf with the ₱25,000 appropriation made available by the 1929 Public Works Act.

Manila.—The Atlantic, Gulf & Pacific Company completed that portion of the South Breakwater contemplated by their contract and also undertook the extension of Dewey Boulevard sea-wall as extra work in connection therewith. The latter was seriously delayed by questions of audit and could not be completed during the working season. A total of 212,721 tons of rock was placed on both projects during the year at a contract price of ₱2.84 per ton.

The construction yard of Pier No. 7 was removed and a small amount of work was done on the Pier proper toward completion of that project.

The usual work of maintenance of the piers, cargo sheds, breakwaters and river walls was carried on during the year, the total expenditures amounting to ₱90,000. The largest item of expense for maintenance of the piers was occasioned by the necessity of repairing the floors and renewing paving blocks. Expenditures for upkeep of Pier No. 3 amounted to ₱17,000; Pier No. 5, ₱27,000; and Pier No. 7, ₱15,000. Nearly ₱20,000 was devoted to the repair of the cargo

Fountain, Iloilo Metropolitan Waterworks

shed and its marginal wharf, and ₱9,000 for the maintenance of the Pasig River wall and the adjoining muelle.

A very serious situation developed early in the year through the failure of the steamer *Dredger* and the long delay in making repairs. In consequence, dredging of the harbor was impossible for ten months of the year. Attention is again invited to the urgent need of acquiring a new and larger dredge of the same type, if the maintenance of Manila Harbor is to be properly carried on.

Dredge No. 4 was prepared for dispatch to Iloilo late in the year, where it will be engaged at least a year in dredging the river channel.

Pulupandan, Occidental Negros.—Work on the Pulupandan port works project progressed satisfactorily throughout the year. The work is being undertaken under contract by the Atlantic, Gulf & Pacific Company, who were assigned the contract by the Ma-ao Sugar Central Company. The construction of the concrete pier and approach, including the replacement of the old wooden approach with concrete, has been completed. The pier and approach have a total length of 449 meters. The main pier is 151.5 meters in length and 21.75 meters in width and is designed for the future construction of a concrete pier shed. Work on the construction of 300 linear meters of creosoted timber sea-wall, the reclamation of 10,000 square meters of land and the construction of 75 linear meters of breakwater, which are included in the contract, is now well underway, and it is expected that the entire project will be completed within a few months.

Dumaguete, Oriental Negros.—The construction of the Dumaguete Reinforced Concrete Pier, contract for which was awarded to Contractor C. V. Powers in November, 1927, was completed at the end of the year, with the exception of the asphaltic pavement and fender piles. The pier is 63 meters in length and 12 meters in width and is supported by 50-centimeter reinforced concrete piles. The pier will provide berthing space for two interisland vessels at the same time, which is considered ample for the needs of the port for some time to come.

Lasi, Oriental Negros.—The 100 linear meters of rock causeway previously constructed at Lasi, was extended an additional 100 meters during the past year. It is proposed to continue the causeway construction for an additional 20 linear meters and construct a small concrete pier at the end to accommodate vessels of 10-foot draft.

Catbalogan, Samar.—Some work on the widening and extension of the Catbalogan causeway was accomplished during the year. Considerable damage to the causeway and temporary landing stage was, however, caused by the November typhoon. It is proposed to repair the damage to the causeway and construct a permanent boat landing for small boats with funds provided by the 1929 Public Works Act. Because of the exposed location of the port, the construction of a pier to accommodate interisland shipping has been abandoned and an investigation will be made at Silanga Bay, a few kilometers north of Catbalogan, with the idea of securing a more protected site for the construction of a pier, or wharf.

Zamboanga, Zamboanga.—Some maintenance work on the existing port structures at Zamboanga was undertaken during the year. A total of 111 reinforced concrete piles were cast for the replacement of the existing wooden wharf approach with a concrete structure. The work of driving the piles will be started in January, 1929, and it is hoped to replace one-half of the wooden wharf approach with a permanent concrete structure during the coming year. The work is being undertaken by administration.

Main Canal, Laoag-Vintar Irrigation System

Maintenance and minor port construction.—The maintenance of the existing port structures and minor construction work were undertaken during the year at Cagayan, Province of Misamis; Larena, Province of Oriental Negros; Cuyo, Province of Palawan; Casiguran, Province of Sorsogon; and Jolo, Siasi, Sibutu, and Bongao, Province of Sulu.

TABLE A.—BRIDGES

Province	River	Road	Type and length in meters	Remarks
Batangas	Rancho	Cuenca-Banaybanay-Lipa.	Steel truss, 31.2	Plans and specifications.
Do	Bayud-bud	Batangas-Cavite.	Steel truss, 37.4	Preliminary plan and estimate.
Baguio	Dungon	Benguet-Pangasinan Boundary.	Steel truss, 37.4	Do.
Bohol	Wahig	Loay-Interior	Steel truss, 40.4	Plans and specifications.
Do	Manaba	Tagbilaran-East.	Steel truss, 31.2	Preliminary plan and estimate.
Bulacan	Manila R. R. track.	Malinta-Rizal Avenue Extension.	R. C. girders superstructure, 16.0.	Plans and specifications.
Do	Bunlo	Manila-North	R. C. girder, 12.0	Do.
Do	Tullahan	Rizal Avenue Extension.	R. C. girder, 30.0	Do.
Capiz	Mambusao	Sigma-Mambusao.	Steel truss, 37.4	Preliminary plan and estimate.
Do	Capiz	Municipal	R. C. sidewalks, 51.8.	Plans and specifications.
Cagayan-Misamis.	Oroquieta	Misamis-North.	Steel truss, 74.7	Do.
Camarines Norte.	Linawan	Daet-Basun	R. C. girder, 16.0	Do.
Camarines Sur	Agus	Bato-Polangui	Steel truss, 80.8	Preliminary plan and estimate.
Cebu	Bangon at Medelin.	Cebu-North	R. C. Arch, 16.0	Plans and specifications.
Do	Dayhagon Channel.	do	Draw bridge, 32.7.	Do.
Do	Mananga	Cebu-South	Steel truss, 139.8	Do.
Ilocos Norte	Pari-ir Creek	San Nicolas-Dingras.	R. C. box culvert, 5.0.	Do.
Do	Balbalay	San Nicolas-Dingras.	R. C. girder 12.0	Do.
Do	Cabua-an	do	R. C. girder 10.0	Do.
Do	Laoag (Gilbert).	Manila-North at Laoag.	Steel trusses, R. C. girders, and trestle approaches, 327.2.	Preliminary estimate.
Do	Badoc	Badoc-Apatot	Steel truss, 347.4	Preliminary plan and estimate.
Ilocos Sur	Sta. Maria	Manila-North	Standard collapsible spans, 170.7.	Plans and specifications.
Do	Sta. Cruz	do	Standard collapsible spans, 170.7.	Do.
La Union	Maragayap-East.	Bacnotan-Balaoan.	Steel truss, 49.7	Plans and specifications.
Do	Amburayan	Manila-North at Tagudin.	Cable tower and anchorage for river Ferry, 405.0.	Do.
Laguna	Sta. Rosa	Manila-South diversion.	R. C. girder with sidewalks and Electric lighting, 6.0.	Do.
Marinduque	Mogpog	Mogpog-Balanacan.	Temporary wooden bridge, 36.1.	Do.
Manila	Pasig	Calle Mendiola Extension.	Steel truss, double electric cars and vehicles roadway with sidewalks and approaches, 131.6.	Preliminary plans and estimate.
Do	Do	Bonifacio-Del Pan.	Steel truss, subway arches and fill approaches with reinforced concrete retaining walls and sidewalks 162.4	Do.
Nueva Vizcaya	Magat		Cable anchorages for river ferry, 180.0.	Plans and specifications.
Occidental Negros.	Talabagan	Bacolod-North	Steel truss 37.4	Do.
Rizal	Las Piñas	Manila-South	Road widened with sidewalks, 19.5.	Do.
Do	San Juan	Manila-Welfareville.	R. C. girder with sidewalks, 55.0.	Do.
Tarlac	Tarlac	Tarlac-Camiling.	Steel truss, 139.8	New preliminary plan and estimate for shorter span.
Do	Camiling	do		Computation of stresses for additional load due to sidewalks.
Zambales	Bancal	Iba-Botolan	Steel truss, 148.9	Preliminary plan and estimate.
Standards			R. C. girders and Roadway, 5.50.	Computation of abutment and pier reactions.
Do			Steel truss 18' roadway.	Computation of stress due to increase roadway.
Do			130' steel truss 18' roadway.	Do.

TABLE B.—PORTWORKS

Province	Port	Type of construction	Remarks
Agusan	Butuan	R. C. pile wharf	Construction completed.
Albay	Legaspi	Port improvement	Survey.
Antique	San Jose	R. C. wharf	Construction completed.
Bohol	Tagbilaran	do.	Do.
Cagayan	Aparri	R. C. jetty	Plans and construction.
Capiz	Capiz	Breakwaters	Construction.
Cebu	Cebu	R. C. wharf	Construction completed.
Do.	do.	R. C. pier	Plans and award contract.
Do.	do.	R. C. wharf	Do.
Do.	do.	Dredging	Underway.
Cotabato	Cotabato	River wall	Construction.
Davao	Davao	R. C. pier	Construction under contract.
Do.	do.	Rock causeway approach.	Do.
Iloilo	Iloilo	River wall	Construction completed.
Do.	do.	R. C. wharf	Plans and advertisement.
Do.	do.	Spur dykes	Construction under contract.
Do.	do.	Jetty	Do.
Leyte	Tacloban	R. C. wharf	Construction.
Manila	Manila	Rock breakwater	Construction under contract.
Do.	do.	Dredging	Underway.
Occidental Negros	Pulupandan	R. C. pier	Construction under contract.
Oriental Negros	Dumaguete	do.	Do.
Do.	Lasi	Rock causeway	Construction.
Samar	Catbalogan	do.	Do.
Sulu	Jolo	Gravity wall	Do.
Zamboanga	Zamboanga	R. C. wharf approach	Do.

TABLE C.—WIRING OF BUILDINGS, PARKS, FOUNTAINS, BRIDGES AND WHARVES

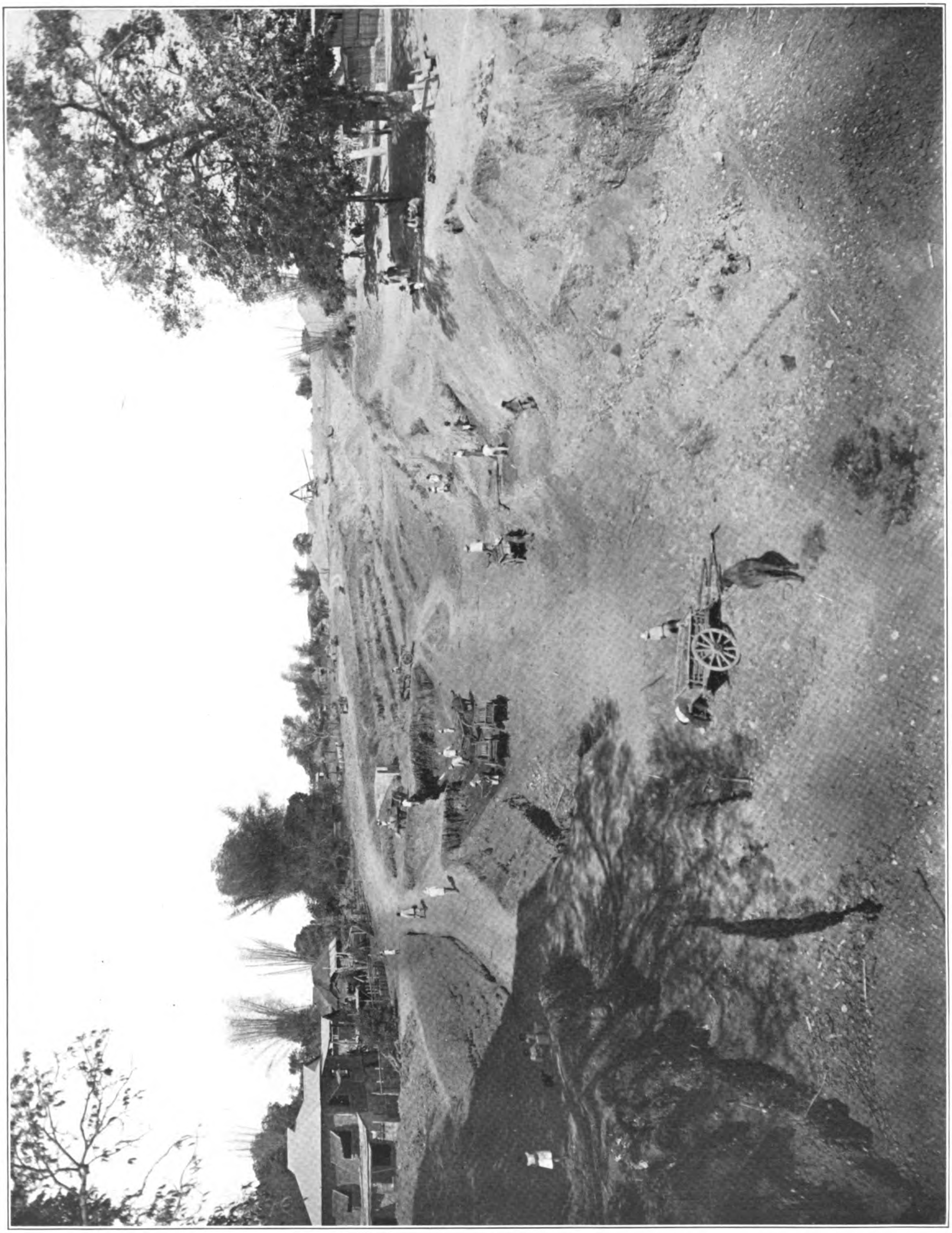
Province	Location	Type	Remarks
Albay	Legaspi	Normal School	Plans and contract.
Do.	do.	R. C. wharf	Plans and specifications.
Antique	San Jose	Provincial hospital	Plans, specifications, and estimate.
Batangas	Batangas	Capitol building (right and left wings).	Completed by contract.
Do.	do.	Ornamental park lighting.	Plans, bill of materials, estimate.
Do.	Bolbok	Presidencia	Plans and specifications.
Cebu	Cebu	Cebu Branch, University of the Philippines.	Plans and specifications. Advertised by U. P.
Do.	do.	Wharf	Plans and bill of materials.
Davao	Davao	Private Patients' Hospital.	Plans, specifications and estimate. Advertised for bids.
Do.	do.	Wharf extension	Plans and specifications.
Ilocos Sur	Vigan	Provincial high school.	Plans, specifications and estimate. Advertised for bids.
Do.	do.	Provincial capitol	Plans.
Iloilo	Iloilo	Fountain	Plans and bill of materials.
Laguna	Lilio	Presidencia	Do.
Do.	Magdalena	do.	Do.
Do.	Nagcarlang	do.	Do.
Do.	Santa Cruz	Provincial court house	Plans.
Do.	San Pablo	Cemetery chapel	Do.
Do.	Santa Rosa	Santa Rosa Bridge	Plans and specifications.
Leyte	Tacloban	Provincial high school.	Do.
Manila	Manila	Contagious, pavilion, Philippine General Hospital.	Completed by contract.
Do.	do.	Contagious pavilion, San Lazaro Hospital.	Conduit work completed by contract.
Do.	do.	Negative Leper Building, San Lazaro Hospital.	Plans and specifications.
Do.	do.	Post Office Building	Plans and contract for conduit work.
Do.	do.	Post office garage	Plans.
Do.	do.	Post office machine and carpentry shop	Do.
Do.	do.	Library, University of the Philippines.	Do.
Do.	do.	Pandacan Research Laboratory.	Plans and contract.
Do.	do.	Bureau of Science Cement Testing Laboratory.	Plans and estimate.
Do.	do.	Bureau of Forestry Annex.	Plans and contract.
Do.	do.	Addition to Dispensary, Philippine General Hospital.	Plans.
Do.	do.	Jones Bridge	Estimates and recommendations for completion.
Marinduque	Boac	Capitol Building	Conduit work completed by administration.
Mt. Province	Baguio	Social Building, Teachers' Camp.	Completed by contract.
Nueva Ecija	Cabanatuan	Presidencia	Plans and contract.
Do.	Agricultural School, Muñoz.	Three cottages	Completed by administration.
Do.	do.	Line work	Being done by administration.
Do.	Cabanatuan	Park lighting	Plans and bill of materials.
Occidental Negros	Bacolod	Provincial capitol	Being done by contract.
Do.	do.	Provincial hospital, private ward.	Plans and contract.
Do.	do.	Provincial high school	Plans.
Do.	Murcia	Mambucal Spring Bath.	Do.
Do.	Pulupandan	Wharf	Plans and specifications.
Pampanga	San Fernando	Provincial high school.	Plans, specifications and estimate. Advertised for bids.
Do.	do.	Standard Provincial Hospital.	Do.
Do.	do.	S. F. River bridge	Plans and bill of materials.
Pangasinan	Lingayen	High-school assembly hall.	Plans.
Do.	do.	San Vicente Creek bridge.	Plans and specifications.
Do.	Bayambang	Normal School call bells system.	Completed by contract.
Rizal	San Felipe Neri	Insular Asylum, male ward.	Completed by contract.
Do.	do.	Insular Asylum, female ward.	Do.
Do.	do.	Insular Asylum, administration building.	Do.
Do.	do.	Insular Asylum, kitchen building.	Do.
Do.	do.	Insular Asylum, garage.	Plans.
Do.	do.	Insular Asylum, male chronic building.	Do.
Do.	Welfareville	Distribution lines	Do.
Sorsogon	Sorsogon	Standard Provincial Hospital.	Plans, specifications and estimate. Advertised for contract.
Tayabas	Mauban	Presidencia	Plans.
Zamboanga	Dapitan	Rizal Memorial Hospital.	Plans and specifications.

TABLE D.—OIL ENGINE DRIVEN ELECTRIC PLANTS

Province	Location	Type	Remarks
Albay	Albay Hospital	Hospital Lighting Plant.	Engine repairs and adjustments.
Batangas	Bauan	Light and Power Plant (municipal).	Inspection and tests for acceptance.
Do.	Batangas	Third General Unit (municipal).	Tests and recommendations.
Do.	Government center	Electric and pumping plant additions.	Estimates and recommendations.
Cebu	Argao	Light and power plant.	Inspection and tests for acceptance.
Manila	Trade school	Power plant, second unit.	Investigations, ready to report.
Marinduque	Santa Cruz	Power and light plant.	General repairs under way
Pangasinan	Dagupan	Hospital light and water supply.	Repairs and battery replacement.
Samar	Catbalogan	50 HP. oil engine unit.	Specifications and correspondence. (Project cancelled.)
Tayabas	Mauban	Street lighting plant.	Contract and tests for acceptance.
Do.	Sariaya	Light and power plant.	Inspection, ready to report.

TABLE E.—HYDROELECTRIC PLANTS

Province	Location	Type	Remarks
Laguna	Los Baños	Quarry Hydro-electric plant.	Plant put into operation. Dam construction finished. Rates fixed.
Do.	do.	Transmission line to College.	Agreements executed for sale of power. Bill of materials. Construction under way by administration.
Mountain Province	Baguio	200 HP. oil engine auxiliary.	Contract awarded.
Zamboanga	Zamboanga	150 HP. oil engine auxiliary.	Do.
Do.	do.	Distributing system extension.	Plans and bill of materials. To be constructed by administration.



MAIN CANAL UNDER CONSTRUCTION, PEÑARANDA RIVER IRRIGATION SYSTEM, NUEVA ECIJA PROVINCE

Table F.—PUMPING PLANTS

Province	Location	Type	Remarks
Batangas	Batangas	Second pumping unit.	Contract awarded.
Do	do	Fire pump	Clutch repairs and magneto protection installed.
Do	Bauan	do	Contract and tests. Magneto protection installed.
Do	Rosario	Waterworks pump	Changed runner.
Do	Taal	Balisong Pump	Inspection and minor repairs.
Bulacan	Bulacan	Waterworks plant	Plans and specifications.
Do	Hagonoy	do	Do.
Do	Malolos	Waterworks pump	Specifications and selections.
Do	Meycauayan	Waterworks plant	Plans and specifications.
Do	San Miguel	do	Specifications and contract.
Cavite	Cavite	Waterworks fire pump.	Tests and magneto protection.
Do	Mendez-Nuñoz	Waterworks plant	Inspection and partial repairs.
Cebu	Cebu	Portable pump unit	Estimates and recommendation.
Ilocos Norte	Badoc	Waterworks plant	Finished by administration.
Laguna	Calamba	Waterworks fire pump	Preliminary study.
Manila	Bureau of Science	Pumping plant	Study and recommendations.
Do	School for Deaf and Blind.	do	Repairs.
Do	Post Office building	Septic tanks and sewage disposal.	Plans and specifications.
Do	do	Drinking water system.	Do.
Do	San Lazaro Hospital	Deep well pump	Inspection and acceptance tests.
Palawan	Puerto Princesa	Waterworks plant	Engine selected from bids.
Pampanga	San Fernando	do	Preliminary study.
Do	Guagua	do	Do.
Pangasinan	Dagupan	Hospital water supply	Pump repairs.
Do	Lingayen	Waterworks plant	Adjustments and repairs.
Rizal	Antipolo	do	Inspection.
Do	Pasay	Deep well pump	Inspection and repairs.
Do	Welfareville	Motor driven pump	Recommendation of equipment.
Do	San Felipe Neri	Asylum water supply.	Installed by administration.
Do	do	Asylum water supply second unit.	Estimates and bill of materials.

Table G.—CALYX CORE DRILLING

Province	Location	Type of structure	Remarks
Albay	Legaspi	Wharf	Borings completed.
Do	S. Rafael, Legaspi	Bridge	Do.
Bataan	Talisay River	do	Borings being taken.
Batangas	Buyud-bud River	do	Borings completed.
Do	Rancho River	do	Do.
Benguet	Dungon River	do	Borings being taken.
Bulacan	Bunlo River, Bocaue.	do	Borings completed.
Do	Tullahan River	do	Do.
Camarines Norte	Daet River, locations A and B.	do	Do.
Do	Daet River (new location).	do	Borings being taken.
Camarines Sur	Agos	do	Borings completed.
Do	Libmanan River	do	Do.
Do	Naga River	do	Do.
Capiz	Culasi, Capiz	Wharf	Do.
Cebu	Abuno River	Bridge	Do.
Do	Cebu	Pier	Do.
Do	Mananga River	Bridge	Do.
Do	Pakidni River	do	Do.
Do	Ilijan River	do	Borings being taken.
Ilocos Sur	Abra River	do	Do.
Iloilo	Iloilo River	River Wall	Borings completed.
Do	Molo River	Bridge	Do.
Do	Tinorian River	do	Do.
Laguna	Malaunod River, San Pablo.	do	Do.
Do	Mayapa River, Calamba.	do	Do.
Lanao	Iligan Bay	Wharf	Do.
La Union	Aringay River	Bridge	Do.
Do	Ballay River	do	Do.
Do	Barikir River	do	Do.
Do	Batuagan Creek, Balaoan.	do	Do.
Do	Bauang River	do	Do.
Do	Cameling Creek	do	Do.
Do	Cava River	do	Do.
Do	Cogcog River	do	Do.
Do	Cupang River	do	Do.
Do	Lomboy River	do	Do.
Do	Macalba River	do	Do.
Do	Masupe Creek	do	Do.
Do	Matanubong River	do	Do.
Do	Pandan River	do	Do.
Do	Pangpang River	do	Do.
Do	Patac River	do	Do.
Do	Principe River	do	Do.
Nueva Ecija	Pampanga River, Gapan.	do	Do.
Occidental Negros.	Benabuno River	do	Do.
Do	Maasin River	do	Do.
Do	Naculo R., Bacolod N.—Rd.	do	Do.
Rizal	San Juan River	do	Do.
Tarlac	Tarlac River	do	Do.
Do	Capas River	do	Do.

Table H.—CEMENT GUN AND SAND-BLAST

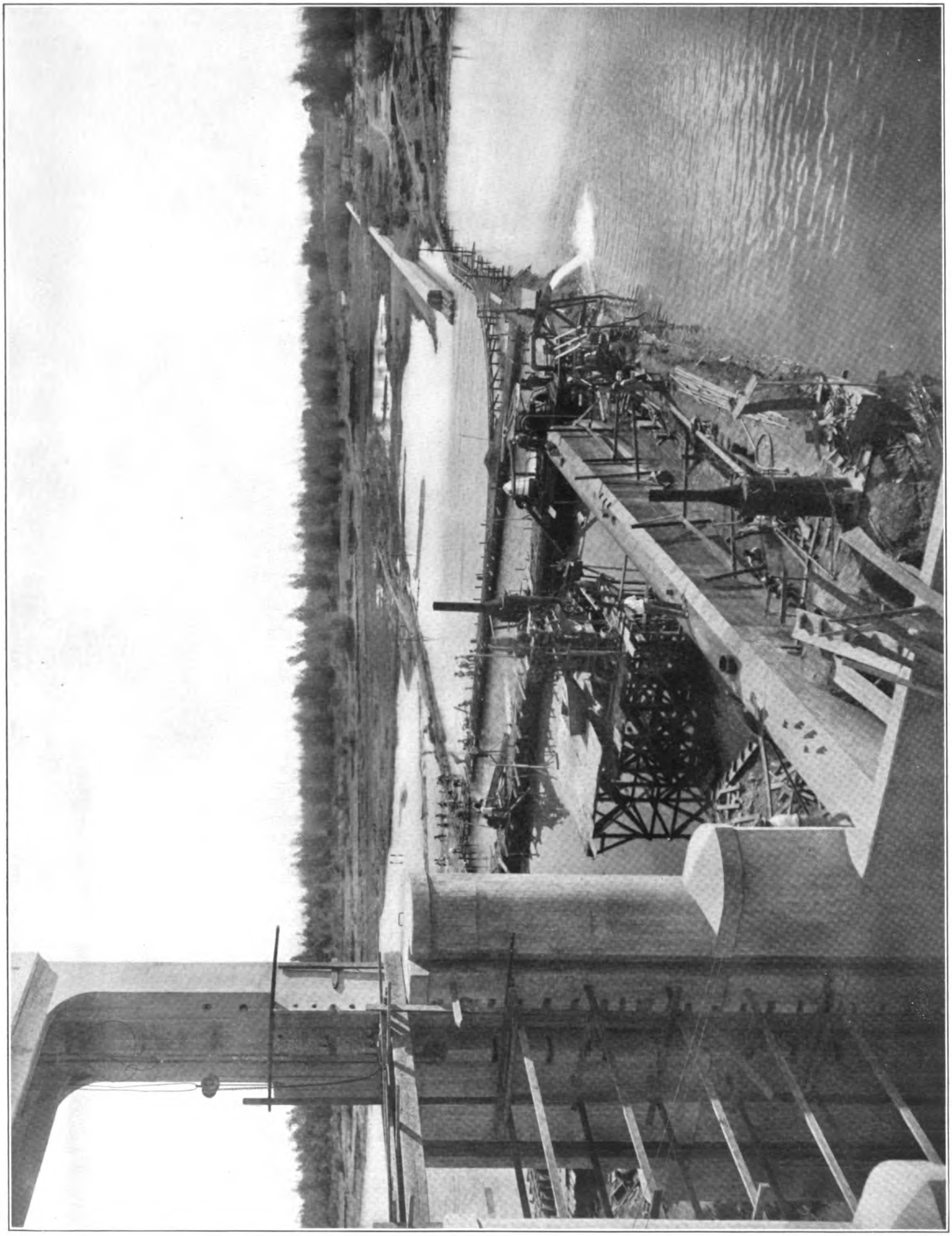
Province	Location	Nature of work	Remarks
Bulacan	Marilao Bridge	Repairs	Cement gun and sandblast.
Do	Bocaue Bridge	do	Do.
Cebu	Various jobs	do	Cement gun.
Leyte	Various bridges	do	Cement gun and sandblast.
Manila	Piers 3 and 5	do	Cement gun.
Occidental Negros.	Pulupandan Pier	do	Cement gun and sandblast work in progress.

Table I.—MISCELLANEOUS MECHANICAL-ELECTRICAL

Province	Location	Type	Remarks
Capiz	Calaan	Quarry	Temporary plans and transfer of machinery from Los Baños.
Davao	Davao	Radio telephone	Investigation and recommendations.
Ilocos Sur	Abra Ferry	Power unit for ferry	Improvement and repairs.
La Union	La Union	Provincial Trade School Power plant.	Machinery layout and specification for engine.
Manila	Bureau of Agriculture.	Portable operating tables.	Contract awarded.
Do	do	New laboratory building, air gas, water and vacuum piping.	Plans and estimate.
Do	San Lazaro Hospital	Crematory	Plans and recommendations.
Do	Bureau of Agriculture.	Pandacan Research Laboratory refrigerating plant.	Specifications prepared.
Do	Manila	Elevators in Insular Legislative Building.	Test for acceptance.
Do	do	U. P. Library elevators.	Preliminary plans of hatch.
Do	do	P. O. Building elevators.	Machine room plans.
Do	Bureau of Labor	Telephone system	Estimates and recommendations.
Nueva Ecija	Muñoz, C.L.A.S.	Lighting plant	Additions and repairs.
Do	do	Cine Building equipment.	Plans and bill of materials.
Palawan	Culion	Bakery machinery	Recommendations.
Pampanga	Arayat	Quarry	Plans and transfer of machinery.
Rizal	San Felipe Neri	Asylum steam kitchen.	Preliminary plans.
Do	do	Asylum ice plant	Contract awarded.

Table J.—INVESTIGATION AND REPORTS

Province	Location	Nature of work	Remarks
Albay	Legaspi	Port development	Investigation, survey and report.
Cebu	Toledo	do	Investigation and survey.
Cotabato	Parang	do	Do.
Ilocos Sur	Abra gap	Ferry drive	Study of propulsion type versus drag line.
Iloilo	Iloilo	Port development	Survey and soundings.
Leyte	Tacloban	do	Do.
Manila	Insular ice plant	Junk machinery	Recommendation for disposal.
Do	San Lazaro Hospital	Crematory	Recommendation and layout.
Do	Bureau of Education	Tractors for farm schools.	Study and recommendations.
Do	do	Engines for trade schools.	Recommendations.
Do	Executive Bureau	Batangas conflagration.	Comment on papers covering investigation.
Do	Insular	Electric water coolers.	Participation with committee on standardization.
Do	do	Standard regulations for general electric plants.	Drafted.
Do	do	Standard regulations for municipal fire departments.	Collaboration in drafting.
Do	do	Standardization of autos.	Reports by committee of engineers.
Do	do	Standard contract form.	Collaboration in revision.
Do	do	Oil engine road rollers.	Inspection for acceptance.
Do	do	Contract form for water power at canal chutes.	Collaboration in drafting.
Do	do	Water power data	Furnished data to Meralco.
Do	do	Comment on proposed laws.	Meralco, Visayan Electric Co. and Orani Electric franchises.
Mountain Province.	Baguio	Telephone system	Study of improvements partially completed.
Occidental Negros.	Pulupandan	Port development	Survey and soundings.
Do	San Carlos	do	Investigation and survey.
Pampanga	Santa Ana	Portable fire engine	Advice rendered.



DIVERSION DAM UNDER CONSTRUCTION, PEÑARANDA RIVER IRRIGATION SYSTEM, NUEVA ECIJA PROVINCE

DREDGING OPERATIONS, 1928

Location	(C. M.) Total 1902 to 1927	(C. M.) Total for 1928	Steamer *Dredger*	Dredges							Total cubic meters
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	
Lower Pasig River	8,265,440	208,940	4,500	204,440							8,474,380
Outer Harbor	5,485,479	159,000	159,000								5,644,479
Upper Pasig River	1,037,615	29,538				8,677		20,058	903		1,067,253
Inner Basin	636,213	22,238	22,000					238			658,451
Binondo Estero	79,276										79,276
Estero de la Reyna	299,706										299,706
Paco Estero	55,920	605						605			56,525
San Miguel Estero	60,842	4,544							4,544		65,386
Provisor Estero	38,354	1,922						1,922			40,276
Marine Railway, Engineer Island	45,407										45,407
Talim Island (City)	1,071										1,071
Outer Bar	1,623,034	65,760	2,000	45,280		18,480					1,688,794
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580										16,580
Engineer Island Canal	37,540	3,200		3,200							40,740
Vitas Estero	749,236	143,764				31,602	112,162				893,000
Quiapo Estero	12,507										12,507
Segado Estero	35,509										35,509
Pandacan	172										172
San Lazaro Estero	22,975	7,619							7,619		30,594
Corregidor Harbor (Q. M.M)	63,746										63,746
Iloilo River	2,964,632										2,964,632
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	30,155										30,155
District of Cavite	20,876										20,876
Tondo Beach	129,184										129,184
Santibañez Estero	24,216	1,662						1,662			25,878
Tanque Estero	28,057										28,057
Tacloban wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato River	49,462										49,462
Earnshaw's Slipways	55,113										55,113
Los Baños Pier	11,160										11,160
United States Navy, Cavite	1,312,160										1,312,160
Concordia Estero	15,415	883						883			16,298
Malabon Canal	36,821										36,821
Port Libas, Capiz	31,413										31,418
Napindan Bar	100,856										100,856
Polo Club	12,471										12,471
Sunog Apog Estero	14,850										14,850
Bankusay Estero	3,390										3,390
Varadero de Manila (Cavite)		8,600		8,600							8,600
Total	24,042,984	658,375	187,500	261,520		58,759	112,162	25,368	13,066		24,701,359

DIVISION OF ARCHITECTURE

C. Mandelbaum, *Acting Chief of Division*

The activties of this Division were substantially increased during the year under review, to take care of the large number of important construction projects, such as the Manila Post Office Building; the Library for the University of the Philippines; the San Lazaro Contagious Pavilion; Philippine General Hospital Contagious Pavilion; Addition to the Dispensary Building, Philippine General Hospital; Addition to the Normal Hall; Bureau of Forestry Annex; Pandacan Research Laboratory, etc., in Manila, and the Albay, Calivo, and Batangas Buildings; the Batangas and Occidental Negros Capitol Buildings; the Laguna Provincial Courthouse; Insular Ayslum Administration Building; and other miscellaneous projects, all of which are enumerated hereunder.

Studies were made and drawings prepared for numerous other projects, such as the proposed Cebu and Bulacan Capitol buildings; the Pampanga Provincial Hospital and new high-school building and the new Ilocos Sur High School Building.

As a result of the enactment of Act 3482 "An Act to clarify the functions and powers of the Director of Public Works, relative to the planning of cities and municipalities of the Philippine Islands," town development plans prepared by this Division and approved by the Municipal Council concerned, may be regarded as more permanent, in that changes may be introduced only when properly authorized and it is evident that same are desirable. A master plan for the City of Iloilo, Iloilo, has been completed and master plans are under preparation for the City of Cebu and other important towns.

Minor changes in the layout of streets and parks were made in the Burham Development Plan for the City of Manila to cope with the increase of population and traffic problems.

The following tabulation shows the status of all projects assigned to the Supervising Architect:

Manila projects	Character	Status
1. Manila Post Office	F. S. details	Under preparation.
2. Machine and Carpentry Shop, Post Office.	Design	Under revision.
3. Garage, Post Office	do	Do.
4. Garage, Normal Hall	Working drawings	Completed.
5. Sketch of bulletin board for the entrance to Pier No. 7.	do	Do.
6. Addition Bureau of Science Laboratory	do	Do.
7. Passage to contagious pavilion, P. G. H	do	Do.
8. Santa Lucia Gate, addition and alteration.	Preliminary drawings	Do.
9. Pandacan Serum Laboratory for the Bureau of Agriculture.	Working drawings	Do.
10. Proposed addition to Bureau of Forestry	do	Do.
11. W. I. Grille door for Piers Nos. 3 and 5	do	Do.
12. Laborers' toilet, Pier No. 7	do	Do.
13. Plan showing existing and proposed arrangement of waterfront, Harrison Park.	Location plan	Drawings underway.
14. General plan of development, City of Manila.	City planning	Completed.
15. Proposed Metropolitan Plan of City of Manila.	do	Under preparation.
16. Development plan for Harrison Park	Design	Completed.
17. Crematory San Lazaro Hospital	Working drawings	Underway.
18. Addition of a delivery platform, commissary room, P. G. H.	do	Completed.
19. Location plan, proposed bridge over San Juan River.	Location plan	Do.
20. Temporary Marquise and window awnings, Araullo Building.		Do.
21. Proposed development of a section in district of Tondo, between Calle Juan Luna, Estero de Vitas, and Estero Sunog Apog.	City planning	Do.
22. Gate and fence wall for San Lazaro Hospital.	Preliminary drawings	Submitted.
23. Rear wing, Rizal Hall, U. P	Working drawings	Under preparation.
24. Armchair for the Secretary of Commerce and Communications.		Completed.
25. Terrace Insular Asylum	Design	Do.
26. Cavite Boulevard, Maytubig, Parañaque.	Location plan	Underway.
27. Male Chronic Building, Insular Asylum	Working drawings	Nearing completion.
28. Luneta Comfort Station	Preliminary plan	Submitted.
29. Luneta Band Stand	Working drawings	Under preparation.
30. Alteration window of Ayuntamiento Building.		Completed.
31. Development of the Normal Hall garden.	Planning	Do.
32. Addition to present dispensary, P. G. H	Working drawings	Do.
33. Improvement of corner between Isaac Peral and General Luna Streets.	Preliminary drawings	Submitted.
34. Engineering Laboratory, U. P	do	Completed.

Manila projects	Character	Status
35. Pandacan Power House, Bureau of Agriculture.	Working drawings	Completed.
36. Typhoon Signal Station, Pier 7	Preliminary drawings	Submitted.
37. Location of Memorial Tablet for Col. McCoy, Fort San Antonio Abad.	Location plan	Completed.
38. Library, University of the Philippines	F. S. drawings	Underway.
39. Zoning plan of the City of Manila	Planning	Completed.
40. Garage and Boys' Dormitory, Insular Asylum, Rizal.	Working drawings	Do.
41. Development plan, Welfareville, Rizal	Planning	Do.
42. Porte cochere, Deaf and Blind School, Pasay, Rizal.	Preliminary drawings	Submitted.
43. Cross-section of buildings and grounds of Insular Asylum.	Design	Completed.
44. Doctor's quarters, Insular Asylum, Rizal.	Working drawings	Nearing completion.
45. Administration building, Insular Asylum.	Details and F. S.	Completed.

Provincial projects	Character	Status
1. Addition to Court of First Instance, San Fernando, Pampanga.	Alteration	Completed.
2. Currimao Presidencia, Ilocos Norte (Compostela type).	Standard plan	
3. Aparri Presidencia, Cagayan (Clarin type).		
4. Tienda Building, Tigaon, Camarines Sur (Std. single 4×5 m.).	Standard plan	
5. Municipal Cemetery, San Pablo, Laguna.	Design	Do.
6. Matadero and midden shed, Sorsogon	Standard plan	
7. Port Area, Misamis, Misamis	Planning	No action.
8. Bacoor Presidencia, Cavite (San Jose type).	Standard plan	
9. Bulan Market Building, 12 × 30 m., Sorsogon.	....do	
10. Topographic map of Teachers' Camp, Baguio.	Location plan	Completed.
11. Paniqui Municipal Building, Tarlac (Calbayog type).	Standard plan	
12. Standard market, Muñoz, Nueva Ecija.	Addition	Do.
13. Consolacion market and tiendas, Cebu.	Standard plan	
14. Malasiqui market and tiendas, 21 m., Pangasinan.	....do	
15. Covered pergola, Teachers' Camp	Design	Do.
16. Cabanatuan market and tiendas building, Nueva Ecija.	Standard plan	Do.
17. Bronze tablet, Locsin Suspension Bridge at Oas, Albay.	Design	Do.
18. Bronze tablet, Bacolod Capitol Building.	....do	Do.
19. General Trias Presidencia, Cavite (San Jose type).	Standard	
20. Rosario Presidencia, Cavite (Clarin type).	....do	
21. Plat of proposed Brent Road, Baguio	Revision	Do.
22. Taguig Presidencia, Rizal (Clarin type).	Standard plan	
23. Libon Presidencia, Albay (Clarin type).	....do	
24. Tabaco Presidencia, Albay (Davao type).	....do	
25. Buenavista Presidencia, Marinduque (Cainta type).	....do	
26. Capiz Provincial Hospital (20 beds, concrete, new type).	....do	
27. Sorsogon Provincial Hospital (20 beds, concrete, new type).	....do	
28. Urdaneta market, Pangasinan, Blocks G and H.	....do	
29. Addition and alterations, Cabanatuan Prison.	Working drawings	Do.
30. Balinoagin Presidencia, Pangasinan (Clarin type).	Standard plan	
31. Calinog market and tiendas, Iloilo	....do	
32. Bronze tablet, Ballesteros Presidencia, Cagayan.	Design	Do.
33. Casiguran market and tiendas, Sorsogon.	Standard plan	
34. Sagay market, Occidental Negros	....do	
35. Lucena School Building (Type 3), Tayabas.	....do	
36. Valladolid market, Occidental Negros	....do	
37. Tacloban High School, Leyte (Pasig Type).	Standard plan (revised)	
38. Vigan High School, Ilocos Sur (Pasig type).	Location plan	Submitted.
39. Banga market, Capiz (Type A 21 m.)	Standard plan	
40. San Simon market building, Pampanga.	....do	
41. Location plan (preliminary), Bulan market, Sorsogon.	Location plan	Completed.
42. Badoc Hospital (Bukidnon type), Ilocos Norte.	Standard plan	
43. Location plan market building (21 m.), Miagao, Iloilo.	Location plan	
44. Presidencia site plan, Umingan (Gumaca type), Pangasinan.	....do	
45. Alaminos market site plan, Pangasinan.	....do	Do.
46. Dingras Presidencia, Ilocos Norte	Alteration	Do.
47. Malolos Market (30 × 48), Bulacan	Standard plan	
48. Standard Hospital, San Jose type, Antique.	....do	
49. Oas Presidencia (San Jose type), Albay (revised).	....do	Do.
50. Standard six-room school building, Bureau of Education.	Working drawings	Do.
51. Covered run-way from the senior kitchen to servant quarters, Teachers' Camp, Baguio.	Design	Being revised.
52. Victorias market building and tiendas, Occidental Negros.	Standard plan	
53. Gapan market and tiendas, Nueva Ecija.	....do	
54. Numancia Rizal monument, Capiz	Design	Completed.
55. Luisiana market and tiendas, Laguna	Standard plan	
56. Proposed bridge over San Juan River, Rizal.	Location plan	Do.
57. Standard Provincial Hospital, Revised Stage IV.	Alteration	Do.
58. Oras Presidencia, Samar (Clarin type).	Standard plan	
59. Narvacan market and tiendas, Ilocos Sur.	....do	
60. Kalibo Provincial Hospital, Capiz (20 beds, concrete).	....do	
61. San Fernando High School, Pampanga (Revised Pasig type).	(Revision standard)	Do.
62. Bangui Presidencia, Ilocos Norte	New design or alteration.	Under study.
63. Pinili Presidencia, Ilocos Norte	Addition	Completed.
64. Legaspi Toilet Building (Lingayen type), Albay.	Standard plan	Do.
65. Gen. J. A. Araneta Memorial School, Bago, Occidental Negros (Malvar type).	....do	
66. Lipa single tiendas (4″ × 4″), Batangas.	....do	
67. Malolos town planning and capitol site, Bulacan.	Preliminary drawings	Submitted...
68. Sipocot Presidencia (Clarin type), Camarines Sur.	Standard plan	
69. Old Government Building, Lingayen, Pangasinan.	Addition and alteration	Completed.
70. Rizal Memorial Hospital, Dapitan, Zamboanga (San Jose type).	Standard plan	
71. Indang Dispensary (Badoc type), Cavite.	....do	
72. Proposed traffic circulation at the junction of Bacolor, Angeles and Mexico, Pampanga.	Town planning	
73. Indang Presidencia (Compostela type), Cavite.	Standard plan	
74. Malolos Capitol Building, Bulacan	Preliminary drawings	Submitted.
75. Passi Presidencia (Magalang type), Iloilo.	Standard plan	
76. Dumangas matadero, Iloilo	....do	
77. Laoag midden shed (5.40 × 8.70 m.), Ilocos Norte.	....do	
78. Romblon School Building (Type 6)	....do	
79. Polangui Presidencia (Gumaca type), Albay.	....do	
80. Tabaco post office, Albay	Preliminary drawings	Do.
81. Proposed site and arch, Santa Rosa Bridge, Laguna.	....do	Do.
82. La Castellana Presidencia (San Jose type), Ilocos Norte.	Standard plan	
83. Monument and bronze tablet, Malolos Capitol Building.	Design	Completed.
84. Standard 10-B school building (revised).	Revision of standard	Do.
85. Bani bandstand, Pangasinan	Working drawings	Underway.
86. Swimming pool, Cabanatuan, Nueva Ecija.	....do	Completed.
87. Governor's residence, Tayabas	....do	Underway.
88. Cottage for Government employees, Lucena.	Preliminary drawings	Submitted.
89. Santa Rita market and tiendas, Pampanga.	Standard plan and location plan.	Do.
90. Masantol Presidencia (standard one-story), Pampanga.	Standard plan	
91. Provincial government toilet, Bayombong, Nueva Vizcaya.	Design	Completed.
92. Addition Davao municipal building, Davao.	Preliminary drawings	Submitted.
93. Mambusao Presidencia (Clarin type) Capiz.	Standard plan	
94. Public confort station (Standard), Bureau of Health.	Working drawings	Completed.
95. Addition and alteration, Tayabas Provincial Building.	Preliminary drawings	Underway.
96. Addition to Lemery Presidencia, Batangas.	....do	Submitted.
97. Oton Market Building, Iloilo	Standard plan and location plan.	Do.
98. Dueñas market and tiendas, Iloilo	....do	Do.
99. San Miguel Market Building and tiendas, Iloilo.	....do	Do.
100. Ambulance and morgue, Bacolod Hospital, Occidental Negros.	Working drawings	Completed.
101. Bronze tablet, San Narciso Waterworks, Tayabas.	Design	Do.
102. Estancia market and tiendas, Iloilo	Standard plan and location plan.	Submitted.
103. Community ball, Capiz	Location plan and preliminary plan.	Do.
104. Solano Presidencia (Clarin type), Nueva Vizcaya.	Standard plan and location plan.	Do.
105. Cebu Trade School, Cebu	Working drawings	Underway.
106. San Quintin Market and tiendas, Pangasinan.	Standard plan and location plan.	Submitted.
107. Faire market and tiendas, Cagayan	....do	Do.
108. Provincial capitol ground developments, Pasig, Rizal.	Location plan	Completed.
109. Janiuay market building and tiendas, Iloilo.	Design and location plan.	Submitted.
110. Plaza of Oton, Iloilo	Design	Completed.
111. Assembly hall, Lingayen High School, Pangasinan.	Working drawings	Do.
112. Junior College, Cebu Branch, U. P.	Working drawings and F. S.	Do.
113. Road Intersection Laguna-Batangas (traffic solution).	Planning	Do.

Bolong–Buenavista Road, Province of Zamboanga, under construction

Provincial projects	Character	Status
114. Iloilo Town Planning	Town planning revision.	In preparation.
115. Calauag, Tayabas, Town Plan	Town planning	Completed.
116. Calauag, Tayabas, Town Plan	do	Do.
117. Proposed Calauag Market	Location plan	Do.
118. Proposed Development of Iloilo R. R. Terminal.	do	In preparation.
119. Development plan, Philippine School of Arts and Trades.	do	Do.
120. Aparri Presidencia	do	Completed.
121. Boac Capitol Building, Marinduque	do	Do.
122. Bais Town Plaza, Bais, Oriental Negros.	Design	Do.
123. Maao Sugar Central Market Site	Location plan	Do.
124. Banate Market, Iloilo	do	Do.
125. San Quintin Market, Pangasinan	do	Do.
126. Balasan Market, Iloilo	do	In preparation.
127. Rizal Monument, Panique	do	Do.
128. Apayo Town Plan	Town planning	Do.
129. Proposed Bicol Leper Station	Location plan	Completed.
130. Malaybalay Center, Bukidnon	do	Do.
131. Plan of Proposed Plaza, Hinigaran, Oriental Negros.	Design	In preparation.
132. Cebu Capitol Site Development Plan	Location plan	Do.
133. Baguio Business District Layout	do	Do.
134. Government Building, Occidental Negros.	F. S. drawings	Completed.
135. Mambucal Spring, Occidental Negros	do	Do.
136. Tuguegarao Town Layout	Town planning	No action.
137. Government Building, Antique	Alteration	Completed.
138. Government Building, Ilocos Sur	Working drawings and revision of plans.	Under way.
139. Numancia Rizal Monument	F. S. details	Completed.
140. Cabanatuan Municipal Building	Details and F. S	Do.
141. Iriga Jose Rizal Monument	do	No action.
142. Bais Jose Rizal Monument	Design	Preliminary drawings submitted.
143. Cabanatuan High School	do	Do.
144. Rizal Monument, Catmon	do	Do.
145. Misamis Provincial Building	Details and F. S	Completed.
146. Bolbok Presidencia, Batangas	do	Do.
147. Lilio Presidencia	Working drawings	Do.
148. Laguna Court House	F. S. and details	Underway.
149. Dapitan Hospital	Same design as Antique.	Completed.
150. Bukidnon Hospital	Details and F. S	Do.
151. Badoc Hospital	Same design as Bukidnon.	Do.
152. Davao Provincial Patients Hospital	Working drawings	Do.
153. Provincial Park and Bath House, Tiwi, Albay.	Design	No funds available.
154. Mainit Bath House, Tayabas	do	Do.
155. Cebu Post Office	do	No action.
156. Development Plan Provincial Grounds, Romblon.	Planning	Do.
157. Tarlac Provincial Grounds	do	Do.
158. Working Men's Chalet, Laguna	Design	Do.
159. Improvement Hospital Grounds, Laguna.	Planning	Do.
160. Cemetery, Biñan, Laguna	Design	Under revision.
161. Fountain Hospital, Davao Public Hospital.	do	Preliminary drawings.
162. Rizal and Bonifacio Monuments, Legaspi.	do	No action.
163. Careagan Presidencia	Alterations and second floors.	Do.
164. Tabaco Presidencia	Alteration	Completed.
165. Umingan Municipal Building	Location plan	Do.
166. Talisay Municipal Building	Tablet design	No action.
167. San Pedro Makati Municipal Building	Working drawings	Completed.
168. Zamboanga Bolony School	Re-design	No action.
169. Batac Presidencia, Ilocos Norte	do	Completed.
170. Dueñas Market, Iloilo	Location	Do.
171. Dispensary Pavilion, Santo Domingo de Basco.	Design	Do.
172. Daet Provincial Building	Vault design	Do.

IRRIGATION DIVISION

Nicanor Cortes, *Chief Irrigation Engineer*

IRRIGATION PROJECTS

There were 3 irrigation projects completed: 3 under construction, 16 in operation, 3 approved for construction, and 65 under consideration during 1928.

The 3 irrigation projects completed during the past year were the extensions of Angat River, Sibalom–San Jose, and Talavera River Irrigation Systems. They command an aggregate area of 6,600 hectares and were completed at a cost of approximately ₱425,000. Although the official opening of these projects was not made till the first of the year, they were in operation during the last growing season.

The 3 systems under construction command an aggregate area of 25,200 hectares and are estimated to cost, completed, ₱5,931,750. It is expected that the Peñaranda River Irrigation Projects and the Laoag–Vintar Irrigation Project will be completed in time to deliver water during the next growing season and will place under irrigation approximately 16,000 hectares of land. The south main canal of Laoag–Vintar Irrigation Project, although uncompleted, delivered water from October 15, 1928, till the crop was harvested, on account of the drought which occurred from the first week of October to the last week of November. The crop thus saved was estimated to be worth approximately ₱300,000.

The 16 Government irrigation systems in operation prior to 1928 command an aggregate area of 61,500 hectares and were completed at a cost of ₱11,764,369.

The Pampanga River, and the Balaoan Irrigation Projects and the extension of Amburayan River Irrigation System were awaiting construction at the end of the year. They cover an aggregate area of 22,700 hectares and are estimated to cost, completed, ₱4,400,000. The release of ₱600,000 for starting construction work on the Pam-

Zamboanga-Misamis Interprovincial Road, Dapitan-Plaridel section, under construction

panga River Irrigation Project, Nueva Ecija Province, was requested on August 11, 1928, but favorable action is still pending. The other two projects are held pending the action of the Provincial Board of La Union.

After providing funds for projects under construction and approved for construction and for improving existing systems, there will be left a balance of ₱631,838.95 from the ₱20,000,000 bond fund authorized by Act 3011 and section 7 of Act 3013.

A more detailed description of irrigation projects completed during the past year, projects under construction, irrigation systems in operation, projects approved for construction and projects under consideration, is given hereunder:

PROJECTS COMPLETED DURING 1928

The extensions of Angat River, Sibalom–San Jose, and Talavera River Irrigation Systems were operated for the first time during the last growing season. Data on these projects are shown in Table II. The following is a brief description of these projects:

Extension of Angat River Irrigation System, Bulacan and Pampanga Provinces.—This extension covers an area of 4,000 hectares and is estimated to cost approximately ₱250,000.

Work on the excavation of laterals and sub-laterals and the construction of structures was done by administration. Work on this extension included the excavation of 102.6 kilometers of canals, and the construction of 171 permanent structures, involving the excavation of 131,480 cubic meters of earth and placing 821.3 cubic meters of concrete and 34,177.4 kilos of steel. There are still a few more laterals to be excavated and structures to be built before the extension can be placed in an efficient operating condition. It is expected that this work will be completed during this dry season. This system was officially opened on January 1, 1929.

TABLE I.—*Irrigation systems in operation*

Name of system	Classification	Province	Date of official opening	Irrigated area *Hectares*	Cost of construction	Cost per hectare	Annual irrigation charges per hectare	Number of years to pay	Remarks
1. Aganao River Irrigation System.	Insular	Iloilo	September 1, 1924	6,400	₱917,000	₱152.96	₱11.66	40	
2. Amburayan River Irrigation System.	do	La Union	June 1, 1926	4,000	1,156,000	289.00	18.29	40	
3. Angat River Irrigation System.	do	Bulacan and Pampanga	July 1, 1926 May 1, 1926	21,000	5,073,769	233.73	15.11	40	
4. Ayala Irrigation System	Municipal	Zamboanga	February 1924	180	17,000	92.89	2.00	....	Operated by Municipal Council of Zamboanga.
5. Baruyen River Irrigation System.	Insular	Ilocos Norte	July 15, 1923	550	89,000	161.52	8.72	40	
6. Dingras Irrigation System	do	do	January 1, 1923	1,010	130,000	128.20	10.21	40	
7. Naic Irrigation System	do	Cavite	January 7, 1923	680	292,000	431.95	22.26	40	Operated by Bureau of Lands.
8. O'Donnell River Irrigation System.	do	Tarlac	July 1, 1926	4,000	650,000	144.44	20.24	20	
9. Pilar Irrigation System	do	Bataan	September 1, 1916	170	27,600	162.39	14.94	40	
10. Sta. Barbara Irrigation System.	do	Iloilo	December 1, 1922	5,000	692,000	142.70	10.21	40	
11. Sta. Maria Irrigation System.	Municipal	Zamboanga	February, 1924	430	23,000	53.39	2.00	Ind.	Operated by Municipal Council of Zamboanga.
12. San Miguel Irrigation System.	Special	Tarlac	August, 1913	4,000	789,000	197.25	Total, 29,000	Yearly	
13. Sibalom–San Jose Irrigation System.	Insular	Antique	July 1, 1926	3,400	385,000	111.42	12.92	20	
14. Tagudin River Irrigation System.	do	Ilocos Sur	July 15, 1925	1,090	375,000	335.16	20.81	40	
15. Talavera River Irrigation System.	do	Nueva Ecija	November 15, 1923	9,390	1,108,000	146.84	9.20 2.50	40	
16. Trinidad Irrigation System	Special	Mountain Province	January, 1921	200	40,000	200.00	....	....	Operated by Bureau of Education.
Total				61,500	11,764,369				

TABLE II.—*Irrigation systems completed during 1928*

Name of system	Classification	Province	Date of beginning construction	Irrigable area	Estimated cost	Cost per hectare	Annual irrigation charges per hectare	Number of years to pay	Remarks
				Hectares					
1. Angat River Irrigation System Extension.	Insular	Bulacan	April, 1927	4,000	₱250,000	₱62.50	₱15.11	40	In operation since June, 1928.
2. Sibalom-San Jose Irrigation System Extension.	do	Antique	April, 1927	1,100	65,000	59.09	12.92	20	Do.
3. Talavera River Irrigation System Extension.	do	Nueva Ecija	April, 1926	1,500	110,000	73.33	9.20	40	Do.
Total				6.600	425 000				

TABLE III.—*Irrigation systems under construction*

Name of system	Classification	Province	Date of beginning construction	Irrigable area	Estimated cost	Allotment made	Progress of construction	Remarks
				Hectares				
1. Dipolog Irrigation System	Insular	Zamboanga	August, 1919.	1,000	₱126,750	₱76,750	60% completed	
2. Laoag-Vintar Irrigation System	do	Ilocos Norte	January, 1923.	6,200	2,505,000	2,280,000	85% completed	To be completed June, 1929.
3. Peñaranda River Irrigation System	do	Nueva Ecija	January, 1924.	18,000	3,300,000	2,634,185	60% completed	To be completed September, 1929.
Total				25,200	5,931,750			

TABLE IV.—*Irrigation systems approved for construction*

Name of system	Classification	Province	Irrigable area	Estimated cost	Remarks
			Hectares		
1. Amburayan River Irrigation System Extension.	Insular	La Union	1,200	₱250,000	Construction of this project held pending final action on Boloan Project.
2. Balaoan Irrigation System	do	do	1,000	150,000	Construction held pending action of Provincial Board.
3. Pampanga Rixer Irrigation System	do	Nueva Ecija	20,500	4,000,000	Construction held pending release of funds.
Total			22,700	4,400,000	

Extension of Sibalom–San Jose Irrigation System, Antique Province.—This extension covers an area of 900 hectares and was completed at a cost of ₱65,000. Work on the extension of laterals and sub-laterals and the construction of structures was undertaken and completed by administration. Work on this extension included 29,000 cubic meters of earthwork and approximately 312 cubic meters of concrete. The system was officially opened on January 1, 1929.

Extension of Talavera River Irrigation System, Nueva Ecija Province.—This extension covers a total area of approximately 1,500 hectares and cost ₱110,000. The construction of Dibabuyan diversion works, the excavation of the canal taking water therefrom, and the construction of structures on this canal, was done by contract with Mr. Pedro Siochi, and was completed in July, 1928. The extension of other laterals was done by administration during the previous year. The extension was officially opened on January 1, 1929.

PROJECTS UNDER CONSTRUCTION

Work was under way during the past year on the projects shown in Table III under the heading: "Systems Under Construction." The status of each of these projects is briefly described hereunder:

Peñaranda River Irrigation Project, Nueva Ecija and Bulacan Provinces.—Work on the canal structures in Zone 1 under contract with F. T. Ryan, was completed on June 25, 1928. Construction of canal structures in Zones 2 and 3 under contract with Mr. S. Nagauye, was also completed on June 25, 1928. During the early part of last year, a demonstration was undertaken by the Pacific Commercial Company of the possibility of using elevating graders, tractors, and other excavating machinery to excavate the main canal and other large canals, with the result that the contractor, Mr. Sotero Baluyot, for the excavation of the main canal and laterals, is now using excavating machinery in his work on the laterals and sub-laterals. In July, 1928, the contractor assigned the excavation of the main canal to Gordon & Haley Construction Company which has undertaken the work by means of 3 steam shovels, 2 derricks, 1 drag line excavator, and several trucks, in addition to employing bull carts and men to undertake the excavation work. At the end of the year, only 37 per cent of the excavation work has been completed. With the progress, however, made towards the end of the year, there was reasonable ground to expect that the excavation work would be completed during the extension of time granted for the completion of the work till August 31, 1929. The construction of diversion works is under contract with Mr. F. T. Ryan and was 86 per cent completed at the end of the year. It is expected that this work will be completed by May, 1929.

With the expected completion of the diversion works, the main canal and a good portion of the laterals and sub-laterals, it is anticipated that the system will be in operation by September, 1929, and will be able to serve approximately 10,000 hectares of land.

Laoag–Vintar Irrigation Project, Ilocos Norte Province.—Pursuant to the recommendations of this office, the extension of the north and south main canals to a point approximately 2 kilometers upstream, and the release of the amount of ₱200,000, in addition to the funds previously made available for the completion of this project, were authorized on February 17, 1928. This work was undertaken by administration and progressed very favorably and well within the estimated cost during March and April. From 2,000 to 3,000 laborers were employed on the work but, contrary to expectations, rains came during the early part of May and the laborers having permanent water-proof quarters quit in large numbers, greatly delaying the work. Houses had to be constructed for the laborers, adding to the cost of the project. During June, elections took many laborers from the work as they had to go long distances to their homes to vote and to take part in the usual pre-election and post-election holidays and by this time the weather had become bad for construction. However, in view of the farmers' urgent demand for water and although the cost was much higher during the rainy season, work was continued in order to save the rice crop.

By October 15 it is was evident that if water was not furnished the rice crop would be a failure, so although the south main canal was not completed, water was turned in and was supplied until the crop matured. The crop thus saved was estimated to be worth approximately ₱300,000.

Several slides developed in the north main canal, thus preventing its early completion pursuant to the original schedule. Work on the project was suspended in September, 1928, on account of shortage of funds. The release of additional funds to complete the work involved in this project has been requested, but no advice of action taken has been received. If funds are made available at an early date, it is believed that the Laoag–Vintar Irrigation Project can be completed by June, 1929.

Dipolog Irrigation Project, Zamboanga Province.—Work on this project was confined to the maintenance of the completed canals and structures. Construction work was suspended on account of lack of funds.

IRRIGATION SYSTEMS APPROVED FOR CONSTRUCTION

The extension of Amburayan River Irrigation System, the Balaoan Irrigation Project, and the Pampanga River Irrigation Project, are the three projects awaiting construction. Data on these projects are shown on Table IV under the heading: "Systems Approved for Construction." The following is a brief description of these projects:

Extension of Amburayan River Irrigation System, La Union Province.—The proposed extension covers an area of 1,200 hectares of land in the municipalities of Bangar, Luna, and Balaoan and is estimated to cost, completed, ₱250,000. This project was approved for construction by the Honorable, the Secretary of Commerce and Communications on December 9, 1926. Construction of this project has been held in abeyance pending action of the Provincial Board of La Union on the Balaoan Irrigation Projects.

Balaoan Irrigation Project, La Union Province.—This project covers approximately 1,000 hectares of land in the municipality of Balaoan and is estimated to cost, completed, ₱150,000. The project was approved for construction by the Honorable, the Secretary of Commerce and Communications on December 24, 1927. Construction of this project is held pending action of the Provincial Board of La Union on the protests which have been submitted against the project.

Pampanga River Irrigation Project, Nueva Ecija Province.—This project covers approximately 20,500 hectares of land in the municipalities of Rizal, Bongabon, Cabanatuan, Talavera, and Aliaga, in Nueva Ecija Province, and is estimated to cost, completed, ₱4,000,000. The project was approved for construction by the Honorable, the Secretary of Commerce and Communications on February 16, 1928. The release of ₱600,000 for starting construction work on this project was requested on August 11, 1928, but no definite action has as yet been had. Bids for the excavation of the main canal and laterals were opened on October 27, 1928, but were all rejected, the prices offered being considered excessive.

IRRIGATION SYSTEMS IN OPERATION

Of the 16 Government irrigation systems in operation, only 12 were administered by this Bureau. The Naic System was operated by the Bureau of Lands, the Trinidad by the Bureau of Education, and the Sta. Maria and Ayala System by the municipal council of Zamboanga. A list of irrigation systems in operation is shown in Table I.

The operation and maintenance of all Government irrigation systems completed, has since October, 1928, been placed under a newly created section of this division. The object is to standardize the procedure on all projects, reduce the cost of operation and maintenance by determining as far as possible the various factors entering into this cost, to delimit duties with a view to securing greater efficiency from the operating personnel, to assist the irrigators to derive the maximum benefits from the system and to hasten the time when prompt payment of irrigation charges shall be the rule, rather than the exception.

An intensive campaign was made during the past year for the improvement of the prevailing practices in rice growing and for the promotion of dry-season farming. Irrigators' associations were organized in different towns and barrios within the irrigated districts, with a view to accomplishing these ends. Seventy-one meetings were held and 11 associations organized.

The collection of annual charges is the most difficult problem at present. Any new policy, affecting large numbers of people, which is radically different from their accustomed procedure, requires a period of education. All projects in operation are in this stage at present, with varying degrees of success. Court action against delinquent landowners has been instituted on many projects and it is believed that the necessity for court action will rapidly disappear as the people are educated to the new order of things and are made to realize the possibilities under the irrigation systems. The collection of the 1927 irrigation charges up to December 1, 1928, was 37.7 per cent of the total due.

Amendments to the Irrigation Act have been proposed with a view to adapting the existing laws to the idiosyncrasies of the people, collecting no charges during the first year of operation, the cost of operation and maintenance alone during the second year, and making the burden of paying the irrigation charges lighter. The object of this proposal was to give landowners time to adopt the best methods and practices to follow under irrigated farming. It was also proposed to impose a penalty for delinquency in the payment of irrigation charges, to stimulate their collection.

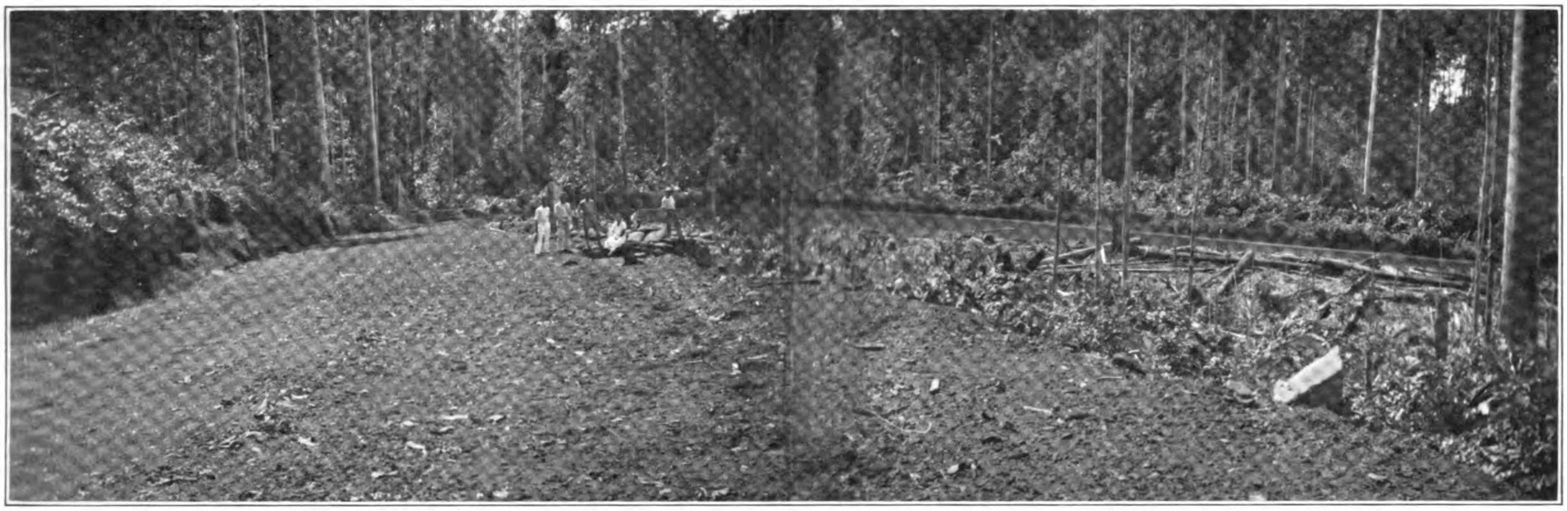
The general annual repairs and replacements needed on all projects have exceeded the estimates and therefore the operation and maintenance costs are somewhat higher than was anticipated.

From the agricultural standpoint, the year 1928 was unsatisfactory to unirrigated land. During the period from June to the middle of August, a dry spell prevailed over the rice regions of Luzon. Thousands of farmers were unable to transplant on time. Heavy losses in seedlings were suffered, and many fields had to be replowed and reharrowed before transplanting could be accomplished. Where transplanting was done before the dry spell occurred, many fields dried out, resulting in great harm to the rice plants. Production per hectare in extensive areas was greatly reduced. Within the irrigated areas, farm operations were carried on without hindrance or delay. The seedbeds were planted, the rice fields were plowed and conditioned to receive the transplanted seedlings on time. During the months of August and September, the poor condition of rice plants on unirrigated areas was in striking contrast to the vigorous growth of those in the irrigated fields.

All superintendents of Government irrigation systems reported that the yields obtained were satisfactory, taking into account existing conditions. Poor farming methods, failure to use proper seed varieties, lack of farm ditches, all contributed toward keeping the yields lower than should be obtained if more attention were paid to the essentials of farming. Despite these conditions, the yields reported were from 40 to 70 cavans per hectare.

On those projects having an assured ample supply of water from May to December, the *Ramai* and *Nunilon* or *Elon-elon* varieties of rice gave excellent yields and the results thus obtained have caused a geat demand for these varieties of seed for planting this coming season. It is believed that the demand can be supplied and that the resulting increased yield due to these varieties will increase the income of the farmers to an appreciable extent. On those projects subject to a fluctuating water supply, the early maturing varieties are being encouraged.

Dry season planting of rice and vegetables is slowly but steadily increasing. There are difficulties to be overcome and these are being solved by the farmers themselves to some extent. The actual demonstration of the advantage of dry season crops is the best method so far devised and it has been noted that where water is available during the dry season, the farmers are gradually becoming aware of the opportunity thus offered and are taking advantage of it on a greater scale each year. Every project shows an increase in dry season crops. The shortage of seeds and seedlings for dry season farming is being overcome by the farmers themselves, by making provision for seeds in advance. Crop pests, their control and elimination and information on better farming methods and practices are being spread among the farmers by the personnel of the systems, and the results, while yet in their beginning, are already visible.



Subgrade, Isabela-Lamitan Road, Island of Basilan, under construction

The following is a brief résumé of the repairs and improvements made on systems in operation during 1928 and a statement of the needed improvements:

1. **Aganao.**—No new construction work was accomplished other than ordinary maintenance work. The need for new laterals is being investigated before any expenditures are made. The question of permiting the passage of bamboo rafts over the dam has not been decided.

2. **Sta. Barbara.**—In addition to the usual maintenance work, three bull cart crossings have been constructed on lateral "Pagsanjan" and an additional length on the upstream retaining wall of the intake. Due to the scour at the headworks, caused by the November (1928) typhoon and flood, block paving and spur dikes will be needed before the next irrigating season, to protect the headworks. Plans and estimates have been prepared for this work. The question of floating bamboo rafts through the dam is pending settlement and to facilitate their passage and to improve the operation of the system, it is proposed to construct a Stoney gate in the sluiceway. Plans and estimates have been prepared. Due to lack of funds, wooden bull cart crossings and other structures cannot be rebuilt of concrete at this time. Temporary repairs have been made.

3. **Amburayan.**—The only construction done during the year was tne building of three pipe culverts across the provincial roads to improve the water service. Several service canals were dug after the landowners refused to coöperate. One wooden flume was constructed by voluntary labor under the supervision of the project. The only new work contemplated is the closing of the slide into the tunnel and the construction of such culverts and service canals as can be built, to improve the water delivery.

4. **Tagudin.**—Service canals were constructed and 75 lineal meters of the tunnel was lined. Materials are on hand for the lining of an additional 200 lineal meters during the coming dry season after water is no longer needed. The Borono Creek diversion is being studied, with a view to its construction under project supervision with labor donated by the interested parties.

5. **Dingras.**—The usual maintenance work was done and a check was built in the main canal at the expense of the interested landowners, at a cost of ₱150. For the coming dry season, the work contemplated is the reconstruction of the washed-out Sidiran Creek 24-inch siphon. Additional checks and bull cart crossings will be constructed if funds are obtainable.

A topographic survey is being made to determine the feasibility of reconstructing the destroyed Curipat Creek extension. This was an old communal system, destroyed by flood in 1910 when the dam failed.

6. **O'Donnell.**—The new construction work done during 1928 consisted of raising Protective dike No. 2, costing ₱14,000, replacement of concrete blocks at the body of the dam and the repair of the falling gate section to facilitate the handling of these gates. One concrete syphon under the railroad tracks was also completed. In addition, the superintendent's quarters and office was also constructed. Several farm ditches were constructed under project supervision. The usual maintenance, consisting mainly of removing accumulated sand from the main canal near the headworks, was carried on, there being 3,200 cubic meters removed during August.

The solution of the sand problem is believed to be in the construction of a Stony gate and sluiceway and plans have been prepared for this structure.

7. **San Miguel.**—The main canal and laterals below the settling basin were cleaned by the Compañía General de Tabacos de Filipinas. The fencing of the canal below the railroad crossing at San Miguel and improvement of the roads on this section were also done by the above company.

The new construction completed during the year consisted of a concrete flume on lateral C, construction of a combined weir-bridge-intake on main canal near the Sugar Central site, the removal of a drop from the canal and the lowering of the crest of another drop. The Tabacalera Company constructed wooden railway bridges on the various canals of the San Miguel and O'Donnell systems after authority for the same had been granted by the Bureau. No new construction work is contemplated for the coming year.

8. **Baruyen.**—No new construction work was done during 1928. The estimate has been made for the repair of the main canal and laterals A and B by plastering the canals where the seepage is greatest and for the repair of the flumes on the above canals. With these improvements there will be more water available for distribution.

9. **Talavera.**—The usual maintenance of structures and canals was carried out. There is no plan for any new construction work, the system being in satisfactory condition to date.

10. **Angat.**—The North and South protection dykes were built by contract, the extension of the system in various places was done by administration and about 9 per cent was completed. The repair of diversion works and structures and cleaning of canals were carried on throughout the year. The work to be done consists of improvement of existing works and structures of a minor nature, for which funds will be made available later.

11. **Sibalom-San Jose.**—This project requires extensive annual river control maintenance and a great deal of sand removal from the main canal and also from the river in front of the headworks.

The new extension to Barrio Hamtic was completed and put into operation.

The construction of a sluiceway and Stoney gate is contemplated and plans have been prepared. A diversion dam is considered necessary and may eventually have to be built.

IRRIGATION SYSTEMS UNDER CONSIDERATION

Complete preliminary studies and estimates of cost were made for the Baras Irrigation Project, Rizal Province, Candon Irrigation Project, Ilocos Sur Province, Iwahig Irrigation Project, Palawan Province, Santa Cruz Irrigation Project, Ilocos Sur Province, Santa Cruz Irrigation Project, Laguna Province, Santa Lucia Irrigation Project, Ilocos Sur Province, and Mainit Irrigation Project, Mountain Province. The following table gives the location, approximate irrigable area and status of the more important projects under consideration.

Province	Project	Irrigable area	Status
		Hectares	
Abra	Abra River	4,000	Awaiting investigation.
Albay	Quinali-Lake Bato	6,000	Do.
Do	Malinao-Tabaco	600	Do.
Bataan	Dinalupihan	2,500	Awaiting investigation.
Do	Orion	1,270	Topographic survey completed.
Batangas	Balayan	300	Investigation in progress.
Do	Batangas	1,000	Do.
Do	San Juan de Bocboc	1,000	Awaiting investigation.
Camarines Norte	Daet	2,000	Topographic survey completed.
Do	Talisay-Indan	5,000	Do.
Camarines Sur	Barit River	2,000	Awaiting investigation.
Do	San Jose-Hagonoy	5,000	Do.
Do	Pauili Valley	2,000	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
Do	Ibajay	500	Preliminary investigation, 1911.
Do	Macato-Malinao	1,200	Do.
Do	Mambusao	1,000	Do.
Cavite	Maragondon	1,400	Topographic survey completed.
Cebu	Balamban River	1,200	Awaiting investigation.
Ilocos Norte	San Nicolas Extension Laoag-Vintar Irrigation System.	1,500	Studies completed. Estimated cost, ₱256,000.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
Do	Candon	1,290	Studies completed. Estimated cost, ₱134,000.
Do	Santa Cruz	1,170	Studies completed. Estimated cost, ₱257,000.
Do	Santa Lucia	1,380	Studies completed. Estimated cost, ₱106,000.
Iloilo	Jalaur River	15,800	Studies made. Estimated cost, ₱4,540,000.
Do	Pototan	2,300	Survey and preliminary design made.
Do	Sibalom River	1,760	Estimated cost, ₱267,000.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz	5,000	Studies made. Estimated cost, ₱1,330,000.
La Union	Agoo-Tubao	2,000	Awaiting investigation.
Do	Bacnotan	500	Studies completed. Estimated cost, ₱251,000.
Do	Naguilian	1,000	Preliminary survey completed.
Do	Rosario	1,000	Topographic survey completed.
Do	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	755	Studies made. Estimated cost, ₱240,000.
Do	Palo	1,000	Preliminary investigation completed.
Do	Dagami-Tanauan	14,000	Awaiting investigation.
Do	Bato Hilongos	3,000	Do.
Mindoro	Bucayao River	2,000	Do.
Mountain Province	Mainit-Bontoc	490	Estimated cost, ₱117,000.
Nueva Vizcaya	Murong	1,870	Estimated cost, ₱130,000.
Occidental Negros	Bago	20,000	Preliminary estimate of cost made.
Do	Binalbagan-Himamaylan	3,000	Topographic survey completed.
Do	Silay	5,000	Awaiting investigation.
Oriental Negros	La Granja Extension Station.	200	Investigation in progress.
Do	Tanjay	800	Awaiting investigation.
Do	Tolong	3,000	Preliminary investigation made.
Palawan	Iwahig	700	Studies completed. Estimated cost, ₱50,000.
Pampanga	Bamban	3,000	Topographic survey completed.
Do	Gumain	5,000	Do.
Do	Porac	1,000	Do.
Do	Lower Pampanga	11,000	Studies made. Estimated cost, ₱3,480,000.
Pangasinan	Agno River	43,150	Estimated cost, ₱8,000,000.
Do	Banilla	5,000	Topographic survey completed.
Do	Mangatarem River	2,000	Recommended for construction, Act 2755.
Do	San Fabian	4,000	Do.
Rizal	Baras	320	Estimated cost, ₱58,000.
Do	Mariquina Valley	5,000	Topographic survey completed.
Do	Morong	320	Estimated cost, ₱72,500.
Do	Pililla	300	Estimated cost, ₱60,000.
Tarlac	Tarlac	20,720	Studies completed. Estimated cost, ₱4,200,000. Landowners opposed to construction.
Tayabas	Mayao	2,500	Awaiting investigation.
Zambales	Iba	400	Preliminary survey completed.
Do	Santo Tomas	6,000	Estimated cost, ₱935,000.
Do	Toton-Lanom	600	Preliminary survey completed.

WATER RIGHTS

A total of 215 new applications for water rights was received during the past year, 186 of which were for irrigation, 8 for domestic, 6 for condensation and 15 for power development purposes. A total of 117 applications were finally acted upon, 114 of which were granted and 3 disapproved by the Honorable, the Secretary of Commerce and Communications, upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 18,929.78 hectares of land.

There were 15 applications for the development of power filed during the year 1928. Two applications for power development were approved for developing a maximum of 3,000 horse power.

There were two streams which were designated for adjudication during the year 1928.

Adjudication on three streams (Ango, Gogo and Anondaan and their tributaries) was completed in 1928, making the total number of streams so adjudicated, 30.

Provisional lists of priorities for the following streams which have been surveyed and investigated are being prepared:

Stream	Year adjudication authorized	Province	Number of diversion ditches	Length of main canal	Number of municipalities affected	Approximate number of hectares of land irrigated
				Meters		
Paranapas Creek	1916	Pangasinan	2	500	2	1,500
Banila River	1919	do	50	10,000	4	25,000
Andulan or Burubor River	1921	do	30	1,000	2	1,300
Bued or Nantayangan River	1922	Nueva Ecija and Pangasinan.	10	1,000	2	2,500

Surveys are in progress with surveying parties in the field on the following streams:

Stream	Year adjudication authorized	Province	Municipality affected	Approximate area of land irrigated
				Hectares
Gugu and Bugo Esteros	1918	Tarlac	Concepcion	3,000
Parua and Balen Rivers	1924	Pampanga and Tarlac	Mabalacat, Bamban and Concepcion.	11,000
Total				14,000

Surveys and investigations on the following streams have been suspended due to lack of funds:

Stream	Year adjudication authorized	Province	Municipality affected	Approximate area of land irrigated
				Hectares
Mooguing-oguing River	1919	Ilocos Norte	Dingras	500
Lubnac Estero	1920	do	Sarrat	300
Burnay River	1921	do	Solsona and Dingras.	1,500
Nagdosaagan River	1922	do	Piddig	800
Maolo River	1922	Pangasinan	Sison and Pozorubio.	2,500
Padsan River	1923	Ilocos Norte	Banna	1,900
Total				7,500

The Irrigation Council met twice during the year 1928 and acted upon a total of 117 water rights applications and one set of rules and regulations for an irrigators' association.

A large number of water right controversies were investigated by the Bureau's personnel and acted upon by the Secretary of Commerce and Communications.

There were some 10,000 certificates of apportionment of water according to priority issued and about 6,000 certificates are still pending.

Kitchen and Mess Hall, Welfareville, San Felipe Neri, Rizal

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream	Year adjudication authorized	Province	Municipality affected	Approximate area of land irrigated
				Hectares
Ynarihan River	1915	Camarines Sur	Naga, Magarao and Calabanga.	1,200
Balingasay Estero	1919	Ilocos Norte	Sarrat	308
Banglayan	1922	Ilocos Sur	Narvacan	2,200
Codoog or Barangubong River.	1922	do	Narvacan and Nagbukel.	1,000
Pias Estero	1922	do	Moncada and San Manuel.	5,000
Nagubuuban Estero	1923	Ilocos Norte	Badoc	300
Inmanduyan or Aloragat River.	1924	Pangasinan	Mapandan, Manaoag, Binalonan, Pozorubio and Sison.	5,000
Del Carmen Creek	1924	Pampanga	San Fernando	5,000
Matua Creek	1924	do	Santa Rita, Guagua, Bacolor and Porac.	800
Labasin and Bulaquin Rivers	1925	Tayabas and Laguna	Tiaong, Dolores and San Pablo.	300
Lusuac Spring	1926	Abra	Bangued and Peñarubia.	300
Lagasit River	1926	Pangasinan	Tayug, Santa Maria, San Quintin, Rosales and Balungao.	2,000
Santa Maria or Villavieja River.	1926	Ilocos Sur and Abra	Narvacan, Santa Maria and Pilar.	2,000
San Juan River	1926	Bataan	Samal	300
Paod River	1926	Pangasinan	Alaminos	300
Talavera River	1927	Nueva Ecija	Carranglan, Muñoz, Santo Domingo, Talavera, Quezon, Aliaga and Zaragoza.	9,000
Gasgas River	1927	Ilocos Norte	Solsona	551
Gaagusan, Balucac and Paligue Creeks.	1927	Tarlac	Concepcion	2,000
Mitra and Macalong Rivers	1927	Pangasinan	San Manuel, Asingan, Binalonan, Villasis and Mapandan.	8,000
Paranum and Pandacaque Creeks.	1928	Pampanga	Angeles, Arayat, Mabalacat, Mexico and Magalang.	4,000
Pagang Creek	1928	Mountain Province	Sadanga	500
Total				49,751

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the division made 2,127 discharge measurements and kept daily gage heights records at 274 permanent gaging stations. No discharge measurements were made at temporary gaging stations during 1928. Systematic gagings of all main canals and some of the larger laterals of Government irrigation systems in operation were also made. Records were kept for 31 rain gages established in localities distant from the Weather Bureau's gages.

SEWERAGE SYSTEMS

The construction of the Vigan Domestic Sewage System, Ilocos Sur, was reported 25 per cent complete at the end of the year. This project is estimated to cost ₱110,000. The work is being financed from the proceeds of a bond issue by the municipality of Vigan. The construction of the Lucena Storm Drain System, Tayabas, was reported 95 per cent complete at the end of the year. This project is estimated to cost ₱150,000.

Preliminary plans and estimates of cost have been prepared for the following projects:

1. Cavite Storm Drain System, Cavite Province	₱80,000
2. Cavite Domestic Sewer System, Cavite Province	95,000
3. Cebu Domestic Sewer System, Cebu Province	440,000
4. Lucena Domestic Sewer System, Tayabas Province	120,000
5. Batangas Domestic Sewer System, Batangas Province	95,000
Total	830,000

RIVER CONTROL PROJECTS

There were 15 river control projects during 1928 for which funds were made available. These projects are enumerated hereunder:

Name	Province	Municipality	Estimated cost	Type of work	Remarks
1. Calacran River Control	Albay	Libon	₱60,000	Dyke and sausage boulder dam.	Under construction.
2. Pansipit River Control	Batangas	Batangas	8,000	Earth dyke	Completed.
3. North Protection Dyke, Angat River Irrigation System	Bulacan	Baliuag	24,000	Earth dyke	Do.
4. South Protection Dyke, Angat River Irrigation System	do	Quingua–Bustos	30,000	do	Do.
5. Danao Seashore Protection	Cebu	Danao	30,000	Concrete sea wall	Under construction.
6. Molo River Control	Iloilo	Molo	36,000	Drainage cut off channel	Do.
7. San Cristobal River Control	Laguna	Calamba	33,000	Concrete bank revetment	Completed.
8. Pagsanjan River Control	do	Pagsanjan	10,000	do	Do.
9. Amburayan River Causeway	La Union	Amburayan	32,000	Concrete causeway	Do.
10. Boac River Control	Marinduque	Boac	10,000	Bank revetment and extension.	Do.
11. Pampanga River Dyke	Pampanga	San Simon, Arayat, San Luis, and Apalit.	25,000	Earth dyke	Maintenance.
12. Potrero and Abacan River Control	do	Santa Rita, Angeles, Bacolor, and Mexico.	60,000	Channel improvement	Under construction.
13. Bayambang Dyke and bank revetment	Pangasinan	Bayambang	100,000	Earth dyke and concrete revetment.	Do.
14. Galarin-Urbiztondo Dyke	do	Urbiztondo	35,000	Earth dyke	Do.
15. Sariaya River Control	Tayabas	Sariaya	25,000	Channel improvement	Do.

WATERWORKS

The division prepared plans and specifications for 35 provincial and municipal waterworks projects on which construction work was started during 1928. Those projects will furnish potable water to a population of 103,800 at an estimated cost of ₱1,620,600. Preliminary design and estimates of cost were also made for 33 provincial and municipal waterworks projects, most of which are to be financed from loans. These projects will supply 120,150 people, at an estimated cost of ₱2,187,000.

Construction work was completed by district engineers on 15 waterworks projects started during previous years, leaving 75 projects under construction at the end of the year. The completed projects cost ₱641,934.90 and serve a total population of 54,300, while the 75 projects still under way are estimated to cost ₱6,156,100 and will provide a potable water supply for 353,555 people. The work completed during the year on some of the larger projects still underway is as follows: (*a*) the 11,500,000-gallon reservoir and the distribution system of the municipalities of La Paz, Pavia, Santa Barbara, Cabatuan, and Maasin for the Iloilo Metropolitan Waterworks; (*b*) the 500,000-gallon reservoir, part of the main line, the distribution systems of the municipalities of Pasuquin and Bacarra and part of the distribution system of Laoag, for the Ilocos Norte Metropolitan Waterworks; (*c*) the main line and part of the distribution systems of the municipalities of Legaspi and Daraga, Albay; (*d*) the main line and part of the distribution system of Bacolod, Occidental Negros; and (*e*) 100,000-gallon elevated concrete tanks for Meycauayan Waterworks, Bulacan, and Guagua Waterworks, Pampanga. The pipe and other materials required for the 32 waterworks projects on which construction was started were imported from the United States and Europe during the latter part of the year.

There are 112 waterworks projects under consideration which contemplate furnishing water to a total population of 361,050 and are estimated to cost approximately ₱6,031,000. As soon as the municipalities concerned are able to finance these projects, construction work may be undertaken, excepting on a few projects which require further investigation.

There have been completed thus far 178 municipal and provincial water supply systems in the Philippine Islands, excluding the Manila Metropolitan Water System, which furnish potable water to a total population of 577,552 and have cost ₱6,706,897.76.

The status of all waterworks projects to date is shown in the accompanying lists as follows:

Table A.—Waterworks projects under construction.
Table B.—Waterworks projects completed.
Table C.—Waterworks projects under consideration.

TABLE A.—WATERWORKS PROJECTS UNDER CONSTRUCTION

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Abra	Bangued Improvement [a]	Gravity		₱17,100	₱11,400	₱5,700.00
Albay	Daraga–Legaspi	do	20,000	220,000	100,000	50,000.00
Do	Barrio San Miguel, Tabaco [a]	do	400	3,000		3,000.00
Do	Ligao–Oas [a]	do	12,000	190,000	50,000	55,000.00
Do	Tabaco [a]	do	5,500	46,000	27,500	15,000.00
Antique	Barbaza [a]	do	1,500	19,000		8,000.00
Do	Patnongon [a]	do	1,000	14,000		10,000.00
Do	Sibalom	do	2,500	27,000	18,000	9,000.00
Batangas	Lian	do	2,000	4,500	3,000	1,500.00
Bohol	Baclayon [a]	do	1,500	27,000	18,000	9,000.00
Do	Guindulman [a]	do	2,000	21,000	11,000	10,000.00
Do	Loon	do	5,000	33,000	22,000	11,000.00
Bulacan	Bulacan	Pumping	6,000	80,000	50,000	25,000.00
Do	Hagonoy [a]	do	9,000	80,000	25,000	33,400.00
Do	Marilao	do	1,200	6,000	4,000	2,000.00
Do	Meycauayan [a]	do	6,000	70,000	25,000	25,000.00
Do	San Miguel	do	7,000	75,000	50,000	25,000.00
Cagayan	Tuguegarao	Gravity	10,000	200,000	50,000	112,500.00
Camarines Sur	Metropolitan Waterworks [a]	do	14,000	330,000	30,000	213,813.18
Do	Pasacao [a]	do	1,000	5,100	3,100	2,000.00
Capiz	Capiz–Ivisan [a]	do	8,000	185,000	43,000	58,000.00
Cebu	Alegria	do	1,000	24,000	6,200	5,889.00
Do	Carcar Improvement	do	4,000	30,000	20,000	10,000.00
Do	Cebu Extension to Labug and Pardo [a]	do		89,000		50,000.00
Do	Minglanilla [a]	do	1,500	12,000	4,000	4,000.00
Do	Moalboal Extension	do	3,000	25,000		8,400.00
Iloilo	Iloilo Metropolitan Waterworks	do	91,500	2,100,000	284,000	1,585,438.56
Do	Pototan–Dingle	do	9,200	209,000	40,000	168,659.78

[a] Projects started during 1928.

TABLE A.—WATERWORKS PROJECTS UNDER CONSTRUCTION—Continued

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Ilocos Norte	Badoc	Pumping	2,800	₱37,000	₱24,500	₱12,418.50
Do.	Ilocos Norte Metropolitan Waterworks	Gravity	34,300	750,000	84,000	425,794.90
Ilocos Sur	Bantay	do.	2,500	9,000	4,000	2,557.49
Do.	Cacayan	do.	1,700	18,000	9,000	7,500.00
Do.	San Vicente	do.	2,000	30,000	19,800	10,700.00
Do.	Santa Catalina	do.	1,500	25,000	13,200	10,250.00
Do.	Santa	do.	875	24,000	16,000	8,000.00
Do.	Santiago [a]	do.	1,300	18,000	12,000	6,000.00
Laguna	Lumban [a]	do.	4,300	22,000	15,000	8,000.00
Do.	Los Baños [a]	do.	6,000	20,000	12,000	7,998.93
La Union	Rosario	do.	1,050	10,000	6,600	3,570.14
Leyte	Maripipi [a]	do.	1,000	4,500	...	1,665.00
Do.	Merida [a]	do.	1,000	10,500	...	3,500.00
Masbate	Aroroy	do.	1,000	8,000	5,000	3,000.00
Misamis	Cagayan Improvement	do.	5,000	38,000	...	34,339.25
Do.	Catarman [a]	do.	4,000	21,000	14,000	7,000.00
Do.	Salay [a]	do.	2,000	14,000	8,000	4,000.00
Mountain Province	Bontoc	do.	2,000	36,000	24,000	12,000.00
Do.	Lubuagan	do.	1,200	8,000	5,000	...
Occidental Negros	Bacolod	do.	8,000	202,000	75,000	112,441.24
Do.	Barrio Toboso, Escalante [a]	do.	800	16,000	10,700	6,000.00
Do.	Calatrava [a]	do.	1,500	36,000	23,500	13,500.00
Do.	Murcia [a]	do.	1,500	45,000	10,000	15,000.00
Oriental Negros	Libertad	do.	1,600	40,800	27,200	12,600.00
Do.	Tanhay [a]	do.	3,000	40,000	12,000	17,000.00
Palawan	Bacuit	do.	1,000	3,200	2,500	700.00
Do.	Balabac Extension	do.	800	5,000	3,200	...
Do.	Barrio Bintuan	do.	1,000	5,500	2,700	1,000.00
Do.	Culion	Gravity and Pumping	5,000	45,000	39,000	...
Do.	Cuyo	Pumping	800	10,000	6,650	3,000.00
Do.	Oton	Gravity	330	5,000	3,000	...
Do.	Puerto Princesa Improvement	Pumping	400	4,500	3,000	1,500.00
Pampanga	Guagua [a]	do.	6,000	70,000	...	21,777.00
Do.	San Fernando [a]	do.	5,000	70,000	25,000	30,000.00
Romblon	Badajoz [a]	Gravity	1,500	24,000	4,000	9,000.00
Do.	Cajidiocan [a]	do.	1,000	12,000	4,000	4,000.00
Do.	Odiongan	do.	3,000	39,000	16,100	15,000.00
Tayabas	Atimonan [a]	do.	6,000	102,000	14,500	50,000.00
Do.	Lucena Improvement	do.	...	39,000	...	38,453.39
Do.	Catanauan	Rain Tank	...	5,000	...	4,402.00
Do.	Laguimanoc	do.	...	5,000	...	3,200.00
Do.	Barrio Hingoso, Macalelon [a]	do.	...	5,000	...	2,000.00
Do.	Casiguran [a]	do.	...	5,000	...	4,000.00
Do.	Polillo [a]	Gravity	...	12,400	...	9,398.64
Do.	Agdangan [a]	Rain Tank	...	5,000	...	2,000.00
Do.	Barrio Sanguirin, Alabat [a]	do.	...	5,000	...	2,000.00
Zambales	San Antonio	Gravity	4,000	54,000	3,674.83	([b])
Total			353,555	6,156,100.00	1,454,024.83	3,462,567.00

[a] Projects started during 1928.

[b] One-third cost guaranteed by Municipal Council and Provincial Board.

TABLE B.—WATERWORKS PROJECTS COMPLETED

Province	Municipality	Cost	Population served	System	Capacity of system per day
					Gallons
Abra	Bangued	₱130,755.85	6,600	Gravity	180,000
Albay	U. S. Reservation Regan Barracks and Legaspi.	60,000.00	5,000	Pumping	259,200
Do.	Camalig	12,450.38	2,500	Gravity	100,000
Do.	Jovellar	13,735.49	2,500	do.	122,400
Do.	Guinobatan	49,853.81	5,000	do.	288,000
Antique	Bugason	18,306.56	2,500	do.	44,000
Do.	Culasi [a]	30,272.95	1,700	do.	100,000
Do.	San Jose	41,846.74	4,000	Pumping	47,520
Bataan	Sisiman	12,138.04	(Cattle)	Gravity	37,000
Batangas	Balayan	7,353.92	2,000	do.	100,000
Do.	Batangas	71,529.96	6,147	Pumping	144,000
Do.	Bauan	41,983.96	4,700	do.	93,600
Do.	Cuenca	5,000.00	2,500	Gravity	5,040
Do.	Lemery	47,132.84	7,200	Pumping	200,000
Do.	Lipa	103,065.87	5,000	do.	172,800
Do.	Rosario	20,232.67	5,000	do.	223,200
Do.	San Jose	44,089.45	4,000	Gravity	216,000
Do.	Santo Tomas	37,108.65	1,910	do.	50,400
Do.	Taal	91,188.34	5,000	Pumping	187,200
Do.	Taal Extension	57,220.41	4,000	do.	80,000
Do.	Talisay	15,562.81	2,130	Gravity	64,800
Do.	Tanauan	55,615.02	2,500	do.	45,000
Bohol	Anda	16,429.84	2,500	do.	100,800
Do.	Calape	26,521.41	2,600	do.	156,000
Do.	Dauis	5,100.00	840	do	77,760
Do.	Duero	10,823.56	2,000	do	86,400
Do.	Inabanga	45,362.63	4,000	do.	160,000
Do.	Jagna	24,115.26	3,000	do.	43,200
Do.	Loay	18,968.72	3,000	do.	144,000
Do.	Loboc	20,063.91	3,000	do.	61,900
Do.	Mabini	6,750.00	1,300	do.	72,000
Do.	Tagbilaran	13,837.47	5,245	Pumping	77,760
Do.	Tubigon	37,094.06	4,800	do.	100,800
Bukidnon	Deliric	(No data)	600	Gravity	4,320
Do.	Malaybalay	11,641.16	1,300	do.	20,160
Do.	San Luis	650.00	500	do.	...
Bulacan	Hagonoy	7,564.87	2,789	do.	50,400
Do.	Malolos [a]	131,179.20	6,000	Pumping	360,000
Do.	Marilao	22,101.50	Bath-house	Gravity	...
Bulacan	Sibul, San Miguel.	₱256,000.00	Bath-house	Gravity	...
Camarines Norte	Mambulac	1,200.00	1,823	do.	...
Do.	Paracale	8,544.03	2,500	do.	100,800
Capiz	Capiz	13,541.92	6,400	Rain tank	264,170
Cavite	Cavite [a]	111,591.58	10,900	Pumping	200,000
Do	Indang	39,627.40	3,000	do.	144,000
Do.	Mendez-Nuñez	60,700.00	1,600	do.	57,600
Do.	Silang	36,154.89	4,000	Gravity	100,000
Cebu	Balamban	25,009.14	4,800	do.	72,200
Do.	Barili	26,958.28	2,067	do.	61,200
Do.	Carcar	64,004.45	4,463	do.	216,000
Do.	Catmon	16,399.56	1,624	do.	38,000
Do.	Cebu	526,000.00	65,000	do.	806,400
Do.	Cebu-Labangon	16,000.00		do.	576,000
Do.	Cebu-Sambag	35,789.18		Pumping	187,200
Do.	Cordova	4,810.74	1,191	Gravity	30,000
Do.	Daanbantayan	5,672.99	579	do.	30,000
Do.	Dalaguete	14,941.15	3,500	Pumping	36,000
Do.	Dalaguete Extension.	27,372.84		Gravity	57,600
Do	Danao [a]	42,055.89	2,500	Gravity	57,600
Do.	Dumanjug	35,638.29	1,500	Pumping	187,200
Do.	Ginatilan	13,404.80	2,669	Gravity	43,200
Do.	Mainit	2,000.00	...	do.	...
Do	Malabuyoc	14,941.15	1,500	do.	104,540
Do.	Moalboal	14,297.27	2,108	do.	54,720
Do.	Naga	6,800.00	3,233	do.	79,200
Do.	Naga Extension	4,552.48		do.	...
Do.	Opon	36,568.44	1,500	Pumping	144,000
Do.	Pilar	5,019.21	702	Gravity	14,400
Do.	Poro	8,873.63	1,000	do.	21,600
Do.	Samboan	7,514.11	2,741	Gravity	49,250
Do.	San Isidro	1,388.13	650	do.	34,560
Do.	San Fernando	20,273.17	3,000	do.	108,000
Do.	San Francisco	6,200.00	1,243	do.	10,000
Do.	Sibonga	35,300.00	2,661	do.	63,360
Do	Sogod [a]	13,221.44	2,200	do.	94,000
Do.	Tuburan	55,335.55	3,900	do.	120,960
Do.	Tudela	8,263.29	851	do.	24,480
Cotabato	Parang	9,600.00	600	Pumping	21,600
Davao	Davao	137,195.14	6,000	Gravity	85,400
Ilocos Sur	Vigan	127,399.52	8,440	do.	201,600

[a] Projects completed in 1928.

TABLE B.—WATERWORKS PROJECTS COMPLETED—Continued

Province	Municipality	Cost	Population served	System	Capacity of system per day
					Gallons
Iloilo	San Dionisio[a]	₱11,483.82	1,500	Gravity	46,500
Isabela	Ilagan	(No record)		Rain tank	40,000
Laguna	Alaminos	28,496.85	1,130	Gravity	95,000
Do	Bay	2,767.72	1,471	do	86,400
Do	Calamba	75,275.98	7,000	Pumping	288,000
Do	Lilio	35,528.77	4,500	Gravity	316,800
Do	Luisiana[a]	50,708.07	4,500	do	216,000
Do	Magdalena[a]	68,549.54	3,000	do	40,000
Do	Majayjay	38,686.06	3,200	do	187,200
Do	Nagcarlang	36,034.42	2,500	do	180,000
Do	Paete[a]	10,428.77	4,500	do	216,000
Do	Pagsanjan	73,782.67	4,044	Pumping	233,280
Do	Rizal[a]	26,777.56	3,000	Gravity	216,000
Do	San Pablo	89,455.82	7,000	do	576,000
Do	Santa Cruz	92,692.43	6,000	Pumping	352,800
La Union	San Fernando	92,732.94	5,000	Gravity	300,000
Leyte	Baybay	72,889.23	8,000	do	136,000
Do	Liloan	7,483.63	700	do	28,800
Marinduque	Boac	6,653.00	1,000	Pumping	57,600
Do	Gasan	22,124.97	1,400	do	144,000
Do	Malbog	13,614.29	1,000	Gravity	61,920
Do	Mogpog	10,535.69	1,280	do	18,288
Do	Santa Cruz	20,696.23	2,560	do	158,400
Do	Torrijos[a]	23,881.93	5,000	do	129,600
Mindoro	Abra de Ilog	4,743.74	350	do	14,400
Do	Bulalacao	3,232.08	700	do	43,200
Do	Calapan	29,743.47	2,500	Pumping	57,600
Misamis	Balingasag	8,924.14	1,514	Gravity	57,600
Do	Cagayan	50,408.82	3,000	Pumping	86,400
Do	Mahinog	6,000.00	5,727	Gravity	
Do	Mambajao	30,000.00	14,446	do	
Do	Sagay	800.00	6,321	do	
Mountain Province.	Baguio	229,605.89	6,000	Pumping and gravity.	350,000
Do	Cervantes	7,565.07	800	Gravity	
Do	Mansion House	2,144.58	100	Pumping	40,000
Do	Teachers' Camp	(No data)	1,500	do	216,000
Do	Trinidad Farm School.	19,330.93	300	Gravity	36,000
Do	Trinidad Stock Farm.	2,000.00	60	do	8,640
Nueva Ecija	Cabanatuan	111,302.49	6,000	Pumping	100,000
Do	Muñoz Agricultural School.	10,000.00	1,000	do	86,400
Oriental Negros	Bacong[a]	27,210.48	1,800	Gravity	43,200
Do	Basac	(No data)	265	Pumping	
Do	Dauin	22,296.01	1,500	Gravity	57,600
Do	Dumaguete	84,131.43	4,000	Pumping	288,000
Do	Guihulngan	21,096.31	3,500	Gravity	144,000
Do	Larena	(No data)			
Do	Lazi	6,980.77	2,300	do	
Do	Luzuriaga	12,317.44	2,500	Gravity	269,200
Do	Maria	1,350.05	1,000	do	7,400
Do	Maria Extension.	2,677.41			
Do	Siquijor	18,000.00	1,587	do	
Do	Siquijor Extension.	(No data)	494	do	
Do	Talingting	5,025.00	2,890	do	6,480
Do	Vallehermoso	17,655.17	2,500	do	115,200
Palawan	Coron	₱7,844.63	1,150	Pumping	20,160
Do	Puerto Princesa	10,268.45	716	do	28,800
Pampanga	Angeles	12,318.52	6,708	do	61,920
Do	Arayat	35,180.95	3,840	Gravity	144,000
Do	San Fernando	1,050.02	1,000	Pumping	86,400
Pangasinan	Alcala	3,000.00	2,200	Gravity	129,600
Do	Bani	12,411.86	2,000	do	86,400
Do	Bayambang	8,652.80	2,400	do	108,000
Do	Dagupan	2,823.02	Market.	do	
Do	Lingayen	3,938.99	do	do	
Do	do	9,141.22	School	do	
Do	do	96,682.22	7,000	Pumping	288,000
Do	Mangaldan	635.53	Market	Gravity	122,400
Do	San Fabian	682.87	do	do	57,600
Do	San Manuel	38,267.76	4,000	do	172,800
Rizal	Antipolo	23,299.07	2,250	Pumping	82,080
Do	Pasig	40,000.00	10,000	do	86,400
Do	Insular Asylum S. Felipe Neri[a]	13,881.86	1,200	do	120,000
Romblon	Looc	27,700.12	2,000	Gravity	144,000
Do	Romblon	(No data)	2,300	do	
Samar	Calbayog		Market	do	20,000
Do	Catbalogan	64,308.94	2,000	do	55,000
Do	Oras	(No data)	4,000	do	
Sorsogon	Bacon	21,000.00	3,200	do	79,200
Do	Gubat[a]	76,998.62	7,000	do	288,000
Do	Magallanes	8,000.00	3,500	Pumping	
Do	Sorsogon	70,701.49	6,000	Gravity	206,000
Do	do	1,044.67	250	Pumping	36,000
Sulu	Jolo	76,974.29	5,000	do	115,200
Surigao	Bo. Bacuag, Gigaquit.	7,500.00	2,405	Gravity	
Do	Lianga	1,924.58	1,290	do	2,880
Do	Placer	13,133.95	870	do	18,720
Tarlac	Moncada	22,122.26	3,000	do	86,400
Tayabas	Candelaria	60,646.04	3,500	do	216,000
Do	Calauag	4,931.75		Rain tank	40,000
Do	Guinayañgan[a]	16,073.26	1,500	Gravity	86,400
Do	Gumaca	4,482.17	1,600	Rain tank	40,000
Do	Infanta	4,424.55	1,200	do	40,000
Do	Lucban	50,205.60	3,200	Gravity	316,800
Do	Lucena	234,390.57	7,500	do	262,000
Do	Mauban	57,209.32	3,500	Pumping	144,000
Do	Mulanay	17,369.53	1,200	Gravity	180,000
Do	Pagbilao	70,538.47	2,300	do	54,700
Do	Pitogo	4,857.57		Rain tank	40,000
Do	Quezon	2,989.62		do	20,000
Do	Sampaloc	22,957.61	3,000	Gravity	129,600
Do	San Narciso[a]	14,297.40	1,000	do	43,200
Do	Sariaya	37,935.00	6,000	do	201,600
Do	Tayabas	125,159.36	4,600	do	173,000
Do	Tiaong	49,694.74	1,800	do	187,200
Do	Unisan	4,490.89		Rain tank	40,000
Zambales	Subic	10,670.62	1,628	Gravity	11,520
Zamboanga	Zamboanga	305,561.30	5,000	do	504,000
Total		6,706,897.76	577,552		20,301,788

[a] Projects completed in 1928.

TABLE C.—WATERWORKS PROJECTS UNDER CONSIDERATION

Provinee	Municipality	Estimated cost	Population to be served	System
Albay	Libog	₱28,000.00	3,000	Gravity.
Do	Libon	244,000.00	3,000	Do.
Do	Polangui		8,000	Do.
Do	Tiwi[a]	39,000.00	3,000	Do.
Antique	Dao	18,000.00	1,100	Do.
Do	Pandan	24,000.00	1,500	Do.
Do	San Jose Extension	40,000.00	1,500	Pumping.
Do	Tibiao[a]	25,000.00	2,000	Gravity.
Batanes	Itbayat	15,000.00	1,000	Do.
Do	Ivana	50,000.00	2,000	Do.
Do	Uyugan		1,500	Do.
Batangas	Batangas	400,000.00	10,000	Do.
Do	Bauan		5,200	
Do	Ibaan		2,700	Do.
Do	San Jose		2,100	Do.
Do	Lobo	12,000.00	1,000	Do.
Do	Lipa Extension	7,000.00		Pumping.
Bohol	Anda Extension[a]	20,000.00	3,000	Gravity.
Do	Calape Extension[a]	33,000.00	700	Do.
Do	Carmen	6,100.00	600	Do.
Do	Clarin	24,000.00	1,000	Do.
Do	Correlia	6,000.00	1,000	Do.
Do	Dimiao	37,000.00	2,000	Do.
Do	Garcia-Hernandez	31,600.00	2,000	Do.
Do	Inabanga Extension	19,000.00	1,000	Do.
Do	Lila	6,000.00	700	Do.
Do	Maribojoc	84,000.00	4,000	Do.
Do	Valencia	24,000.00	2,000	Do.
Bukidnon	Impasugong	36,000.00	1,600	Do.
Bulacan	Baliuag	120,000.00	8,000	Pumping.
Do	Obando	75,000.00	5,000	Do.
Do	Pulilan	18,000.00	3,000	Gravity.
Bulacan	San Ildefonso	₱45,000.00	2,500	Pumping.
Do	Santa Maria	40,000.00	3,000	Do.
Cagayan	Aparri	346,000.00	9,200	Do.
Do	Camalaniugan		2,350	
Do	Lallo		1,400	
Camarines Sur	Iriga	70,000.00	10,000	Do.
Do	Lagonoy[a]	42,000.00	4,000	Gravity.
Capiz	Dumalag	60,000.00	5,000	Do.
Cavite	Dasmariñas	31,000.00	5,000	Do.
Cebu	Alegria Extension[a]	13,000.00	1,500	Gravity.
Do	Asturias	27,000.00	1,100	Pumping.
Do	Argao	39,000.00	4,500	Gravity.
Do	Badian	30,000.00	1,700	Do.
Do	Bantayan	20,000.00	4,000	Pumping.
Do	Barili Extension	8,600.00	300	Gravity.
Do	Barrio Dapdap, Pilar[a]	20,000.00	1,500	Do.
Do	Barrio Esperanza, Poro[a]	6,900.00	500	Do.
Do	Barrio Malones	25,000.00	1,600	Do.
Do	Barrio Villahermosa, Tudela.[a]	6,000.00	500	Do.
Do	Cebu Leprosarium[a]	90,000.00	800	Pumping.
Do	Consolacion[a]		1,200	
Do	Mandaue[a]		4,500	
Do	Dumanjug Improvement	32,000.00	3,200	Gravity.
Do	Cebu Extension to Mandaue.	35,000.00		Do.
Do	Oslob	15,000.00	2,000	Do.
Do	Ronda	30,000.00	1,900	Do.
Do	San Francisco Improvement.	27,000.00		Do.
Do	Talisay	30,000.00	2,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Pumping.

[a] Projects for which design and estimate were made during 1928.

TABLE C.—WATERWORKS PROJECTS UNDER CONSIDERATION—Continued

Province	Municipality	Estimated cost	Population to be served	System
Cotabato	Cotabato [a]	₱100 000.00	4 000	Gravity.
Davao	Davao Improvement [a]	200,000.00	4 000	Do.
Ilocos Sur	Barrio Pandan	9 000.00	700	Do.
Do.	Magsingal	63,000.00	4 000	Do.
Do.	San Esteban [a]	9,000.00	1,500	Do.
Iloilo	Ajuy	8,000.00	1,100	Do.
Do.	Sara	42 000.00	2 000	Do.
Laguna	Calauan [a]	42 000.00	3 000	Do.
Do.	Lilio Extension	27 500.00	2 500	Do.
Do.	Pila	60 000.00	2.200	Pumping.
Lanao	Iligan	42 000.00	4 000	Gravity.
La Union	Agoo	24 000.00	1 500	Do.
Do.	Naguilian	39 000.00	2,500	Do.
Do.	San Fernando Extension [a]	3 600.00	....	Do.
Leyte	Baybay Agricultural School.[a]	8,000.00	500	Do.
Do.	Barrio San Ricardo, Pintuyan.[a]	2,500.00	800	Do.
Do.	Leyte Metropolitan Waterworks.[a]	680,000.00	23,500	Do.
Do.	Maasin	30 000.00	3,300	Do.
Do.	Villaba	9.000.00	1,700	Do.
Masbate	San Fernando	21 000.00	2,500	Do.
Do.	Masbate [a]	56 000.00	4,000	Do.
Marinduque	Boac Capitol Building	6,500.00	500	Pumping.
Misamis	Jasaan	20 000.00	2 500	Gravity.
Do.	Jimenes	30 000.00	4,000	Do.
Do.	Misamis	66 000.00	3,450	Pumpirg.
Do.	Talisayan [a]	27 000.00	2,800	Gravity.
Mountain Province	Itogon [a]	3 000.00	250	Do.
Nueva Ecija	San Jose [a]	60 000.00	5,000	Pumping.
Occidental Negros	Silay	461,000.00	6,000	Gravity.
Do.	Sumag		1,300	Do.
Do.	Talisay		6,000	Do.
Occidental Negros	Pinucutan	₱2,300.00	....	Gravity.
Oriental Negros	Ayungon	21.000.00	1 000	Do.
Do.	Bais [a]	36 000.00	3,000	Do.
Do.	Barrio Bolcs	9,000.00	1,100	Do.
Do.	Luzuriaga Extension	8.500.00	650	Do.
Do.	Manhuyod	12 000.00	2 000	Do.
Do.	San Juan	21 000.00	2 000	Do.
Do.	Tayasan [a]	18 000.00	2 500	Do.
Do.	Zamboanguita [a]	50 000.00	3.000	Do.
Palawan	Concepcion	3 600.00	600	Do.
Do.	Coran Improvement	13 000.00	600	Do.
Pampanga	Angeles	80 000.00	8 000	Do.
Pangasinan	Malasiqui	30 000.00	2 600	Pumping.
Do.	Urdaneta	1 800.00	....	Gravity.
Rizal	Pasig Extension	27 000.00	5 200	Pumping.
Samar	Calbayog–Oquendo [a]	250 000.00	7 000	Gravity.
Do.	Llorente	14 000.00	2 500	Pumping.
Do.	Oros Improvement	10 000.00	3 500	Gravity.
Do.	Wright [a]	45 000.00	3 000	Do.
Sorsogon	Barcelona [a]	25,500.00	4.000	Do.
Do.	Bulan [a]	105 000.00	9 000	Do.
Do.	Casiguran [a]	70 000.00	5.000	Do.
Do.	Castilla [a]	30 000.00	1 500	Do.
Do.	Casiguran [a]	114,000.00	5 000	Do.
Do.	Juban [a]		5 000	Do.
Do.	Matnog [a]	16 000.00	2,500	Do.
Surigao	Surigao	48 000.00	4 000	Do.
Tarlac	Tarlac	135 000.00	6 000	Pumping.
Do.	Tarlac Extension	4 000.00	1 000	Do.
Tayabas	Barrio Bondo, Mulaney [a]	6 000.00	300	Gravity.
Do.	Catanauan [a]	40 000.00	4 000	Do.
Do.	Dolores [a]	24 000.00	2 500	Pumping.
Do.	Tayabas Extension	20 000.00	1 200	Gravity.
Total		6.031,000.00	361,050	

[a] Projects for which design and estimate were made during 1928.

APPENDIX

ACTIVE PROJECTS, JANUARY 1, 1929

Provinces	Roads and trails			Bridges and culverts			Provincial capitols			Presidencias		Prisons			Schools		Markets and tiendas		Hospitals			Miscellaneous buildings			Water systems			Electric light plants			Artesian wells		Port works			Miscellaneous projects							Total
	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Construction	Maintenance	Reconstruction	Wireless stations	Surveys and investigations	Irrigation systems	River control	Provincial or mun. boundaries	Monuments	Unclassified	
Abra	3	4		1											7							1			1												1					1	19
Agusan	4	2		1											3				1			1											1			1	1				1	1	17
Albay	15	1	2		1	1				2					6				3				2		3								2				4					3	45
Antique	4	2							1		3				3										4																		17
Bataan	2	3		1					1	1	2					1																					1	1		1			14
Batangas	10	1	1							1	1				7		2		1						3			1														2	30
Benguet	5	6									1				1		1	1		1		5	2	1	2												1					17	44
Bohol	7	4		2						1					2		1								2									2									21
Bukidnon	3	2	1																1			1																					8
Bulacan	6	3	3	3			1								2				1			3	2	1	5	1					1	1					1					9	43
Cagayan	5	4								2					5		1						1		1						1			1			1					2	24
Camarines Norte	4	3	1	1		1				1					6		1					1			1																		20
Camarines Sur	9	3	1					1		3			1		3		7	1		1			1		2							20					2					1	56
Capiz	7	2								2					5		3		1			1			2									2			1						26
Cavite	8	5	4	2						3					10				1						1												1	1				6	42
Cebu	6	3		4			1								18		2		1	1			1		4		1						1	4		2						3	52
Cotabato	4	4					1				1				2	1	1				2	2	4		1								1				2				1	5	32
Davao	11	7	2	1			1				1				4				2			3											2			3	1				3	1	42
Ilocos Norte	9	3			1		1			1							3								2																		20
Ilocos Sur	5	6													6										6												1					2	26
Iloilo	18	3	1												2	1						1			1	1							5						1			3	37
Isabela	7	1			1					2					10								1	1																			23
Laguna	5	2	3				1								4								1																			1	17
Lanao	4	3												1					1			1	2		1							2	2										17
La Union	7	18	1	3											1				2			1			1												2	1				1	38
Leyte	8	2	4	1						1					5										1								2				2		1			1	28
Manila																			4	6		5	61											4								156	236
Marinduque	5	7								2					4				1																								19
Masbate	7	2								1					1		1								1							1					1						15
Mindoro	4	5	2												4	2				1		2	1										1				1						23
Misamis	7	3	5	1						1					8	4	1			2		1			3		1							1			1					1	40
Mountain Province		6								2							2	1			1	1																				1	14
Nueva Ecija	18	1		2				1							2	4	4				1	2	1	1			1										1					2	41
Nueva Vizcaya	2	4	1								1								1																			1	1			1	12
Occidental Negros	12	3		4			1			2					3		2				1	2			4																	2	36
Oriental Negros	6	5													5		1					1			1								2		2		1						24
Palawan	1	1						1							4	1			1				2				1							1	1		1						15
Pampanga	4	3		1											4										2												1		2				17
Pangasinan	8	4	1	1					1	6						5	4					1		1										2								3	37
Rizal	14	3	2			1									3								1		1												2					1	28
Romblon	4	1													7										2												1						15
Samar	10	2	1							1					6										2		1						1									1	25
Sorsogon	6	2													1		2		1			1											1		1								15
Sulu	15	2	3														1							4										2			1					1	29
Surigao	2	2	1												3							2												1			1						12
Tarlac	2	2		2	1																	4																				2	13
Tayabas	16	3	2	1	1				1						8	1	1					2		1	9		2	1					3		1	1	1					1	56
Zambales	6	2													6																												14
Zamboanga	6	4	1														1		1			3			2			1					1			2						1	23
Total	331	164	43	32	5	3	7	3	4	35	10	0	1	1	181	20	42	3	24	12	5	48	83	10	71	2	7	3	0	0	2	24	25	20	5	9	35	4	5	1	5	232	1,517

NOTE.—Under the heading "Unclassified" are included projects not embraced by any of the above classifications, such as telephone lines, parks, grounds and athletic fields, fences for schools, hospitals, presidencias, lighthouses, swimming pools, etc.

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

[Corrected to January 1, 1929]

A. D. WILLIAMS, *Director of Public Works*
MARCIAL KASILAG, *Chief Constructing Engineer*
J. C. COOKINGHAM, *Acting Chief Designing Engineer*
NICANOR CORTES, *Chief Irrigation Engineer*
C. MANDELBAUM, *Acting Chief, Division of Architecture*
R. REINOSO, *Chief, Administrative Division*

CENTRAL OFFICE ORGANIZATION

DESIGNING DIVISION

L. L. Vincent, Supervising E. and M. E.
Juan Piedad, C. E.
Domingo Guanio, C. E.
Eliodoro Segui, C. E.
Ross Hagler, Principal Engineering Aid.
Manuel I. Felizardo, E. and M. E.
Venancio A. Gloria, C. E.
Alejandro J. Villanueva, C. E.
Ciriaco Coronel, E. and M. E.
Anastasio Pasos, M. E.
Cosme Ventura, E. E.
Vicente Villanueva, Asst. E. E.
Pablo Ilagan, Asst. E. E.
Feliciano Palma, Structural Draftsman.
Elpidio Molina, Structural Draftsman.
Arsenio P. Luna, Asst. C. E.
Marcos Amponin, Asst. M. E.
Domingo de la Paz, Asst. C. E.
Eugenio P. Ylo, Asst. C. E.

DIVISION OF ARCHITECTURE

1. C. Mandelbaum, Acting Chief.
2. J. M. Arellano, Supervising Architect.
3. Antonio Toledo, Architect.
4. Teodato P. Macabulos, Designing Engineer.
5. J. O. Altiveros, Architect.
6. Sancho B. de Leon, Civil Engineer.
7. Gregorio Alcantara, Civil Engineer.
8. Aurelio N. Cobangbang, Civil Engineer.
9. Ephraim G. Gochangco, Assistant Civil Engineer.
10. A. Fernandez de Castro, Assistant Civil Engineer.
11. Angel N. Pascual, Assistant Civil Sngineer.
12. Antonio M. Paterno, Assistant Civil Engineer.

DIVISION OF ARCHITECTURE—Cont.

13. Librado M. Vizcarra, Assistant Civil Engineer.
14. Benedicto Padilla, Assistant Civil Engineer.

CONSTRUCTING DIVISION

J. V. Bagtas, Special Detail, Department Secretary's Office.
E. D. Smith, Division Engineer, First Division.
Luis Francisco, Division Engineer, Second Division.
Fidel V. Larracas, Division Engineer, Third Division.
V. Fragante, Acting Division Engineer, Fourth Division.
V. Fragante, Division Engineer, Fifth Division.
Mamerto Cruz, Highway Engineer.
Bernardino C. Guerrero, Chief Locating Engineer.
A. T. Sylvester, C. E., Constructing Engineer.
V. Fernandez Lavadia, C. E.
Jose Wright, C. E., Superintendent, Maintenance, Alteration and Repair.
Andres Villegas, Asst. C. E., Spl. Duty.
Vicente Purugganan, Asst. C. E., Spl. Duty.
V. M. Ninobla, Asst. C. E., Spl. Duty.
H. Franco, Chief Electrician.
V. Castillo, Superintendent of Dredges.
F. W. McCaw, Supt. of Artesian Wells.

IRRIGATION DIVISION

Nicanor Cortes, Chief Irrigation Engineer.
W. J. Lamon, Project Engineer.
H. O. Bauman, Project Engineer.
Gonzalo Garcia, Project Engineer.

IRRIGATION DIVISION—Cont.

Hilario S. Clemente, Designing Engineer.
Graciano J. Militante, Project Engineer.
Manuel Gonzales, Civil Engineer.
Gregorio de Leon, Civil Engineer.
Julian A. Buendia, Civil Engineer.
Crisostomo Almajose, Civil Engineer.
Jose O. Lahoz, Civil Engineer.
Vicente R. Cruz, Civil Engineer.
Felipe R. Jimenez, Civil Engineer.
Bartolome Puzon, Civil Engineer.
Alfredo G. Eugenio, Supt. of Irrigation.
Faustino Salvador, Supt. of Irrigation.
Fernando Arnaldo, Supt. of Irrigation.
Ramon C. Caluya, Supt. of Irrigation.
Procopio F. Eleazar, Assistant Civil Engineer.
Agapito Alano, Assistant Civil Engineer.
Eleuterio Macalalag, Assistant Civil Engineer.
Antonio A. Villanueva, Assistant Civil Engineer.
Servando Suguitan, Assistant Civil Engineer.
Nicolas R. Jimenez, Assistant Civil Engineer.
Albert L. Morrow, Assistant Civil Engineer.
Filemon C. Rodriguez, Assistant Civil Engineer.
Tomas T. Zita, Assistant Civil Engineer.
Filemon Zablan, Assistant Civil Engineer.
Andres O. Hizon, Assistant Civil Engineer.
Jacinto Gochoco, Chief Hydrographer.
Wilfred Demers, Supervising Hydrographer.
Arturo Pancho, Hydrographer.
Roberto P. Villatuya, Hydrographer.
Antonio Baldonado, District Hydrographer.
Manuel V. Trani, Assistant Hydrographer.
Lorenzo Ylarde, Assistant Hydrographer.
Artemio Abaya, Chief Water Rights Inspector.
Mariano N. Leones, Supervising Surveyor.
Eliseo M. Panopio, Surveyor.
Hilarion S. Silayan, Agriculturist.

DISTRICT ORGANIZATION

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Florentino de la Fuente, Asst. C. E., Mt. Province.
Deogracias L. Pablo, Asst. C. E., Mt. Province.
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Jesus Cordero, Asst. C. E., Cavite.
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M. Mario Bundalian, Asst. C. E., Pampanga.
Bonifacio Eusebio, Asst. C. E., Pampanga.
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Jose Preysler, Asst. C. E., Rizal.
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Lorenzo J. Samonte, Asst. C. E., Tarlac.
R. M. Contreras, Asst. C. E., Tarlac.
Jose G. Licuanan, Asst. C. E., Tarlac.
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Arturo M. Gonzales, Asst. C. E., Albay.
Ramon Madrigal, Asst. C. E., Albay.
Dominador Ermitaño, Asst. C. E., Albay.
Isaias Fernando, D. E., Batangas.
Gregorio Matanguihan, Asst. C. E., Batangas.
Amando Mirasol, Asst. M. E., Batangas.
G. E. Imperial, D. E., Camarines Norte.
Fidel S. Manio, Asst. C. E., Camarines Norte.
Antonio R. Soriano, Asst. C. E., Camarines Norte.
Homobono H. Gonzalez, D. E., Camarines Sur.
Carlos Leaño, Asst. C. E., Camarines Sur.
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Agapito C. Tuason, Asst. M. E., Laguna.
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Santiago C. Magbuhat, Asst. C. E., Tayabas.
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Alfonso Ungson, Asst. C. E., Tayabas.
Fil de Peralta, Asst. C. E., Tayabas.
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Gil Mallare, Asst. C. E., Antique.
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Carlos Amoranto, Asst. C. E., Capiz.
Rufino Garcia, Acting D. E., Cotabato.
Mariano Flores, Asst. C. E., Cotabato.
Mariano Dy Reyes, Asst. C. E., Cotabato.
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Galo C. Castronuevo, Asst. C. E., Iloilo.
Carlos Salcedo, Asst. C. E., Iloilo.
Severino Fernandez, D. E., Occ. Negros.
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Deogracias Estrella, Asst. C. E., Spl. Duty, Palawan.
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Jose H. Pañganiban, Asst. C. E., Spl. Duty, Agusan.
Jose Ignacio, Asst. C. E., Agusan.
Emilio Buenaventura, Acting D. E., Bohol.
Francisco Santana, Asst. C. E., Bohol.
Pedro Fornilleza, Asst. C. E., Bohol.
H. C. Garretson, D. E., Cebu.
Francisco Fabros, Asst. C. E., Cebu.
Antonio Aseniero, Asst. C. E., Cebu.
Jose Chavarria, Asst. C. E., Cebu.
Juan G. Peralta, Asst. M. E., Cebu.
Alejandro Rivera, D. E., Lanao.
Teodoro R. Mocorro, Asst. C. E., Lanao.
Roy N. Allen, Acting D. E., Leyte.
Pedro M. Lladoc, Asst. C. E., Leyte.
Joaquin L. Panis, Asst. C. E., Leyte.
Marcelino Samson, Asst. C. E., Leyte.
Francisco Katigbak, D. E., Masbate.
Jose Follosco, Acting, D. E., Misamis.
Dionisio Escobar, Asst. C. E., Misamis.
Bonifacio Salas, Asst. C. E., Misamis.
Edilberto Evidente, Asst. C. E., Misamis.
Antonio E. Reyes, Asst. C. E., Misamis.
Pastor Avisado, Acting D. E., Samar.
Miguel P. Taña, Asst. C. E., Samar.
F. J. Zulueta, Asst. C. E., Spl. Duty, Samar.
Conrado Gomez, Asst. C. E., Sp. Duty, Samar.
Ciriaco P. Rama, Surveyor, Samar.
Miguel Y. Garcia, D. E., Surigao.
Rufino Pimentel, Asst. C. E., Surigao.

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THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS
PHILIPPINE ISLANDS

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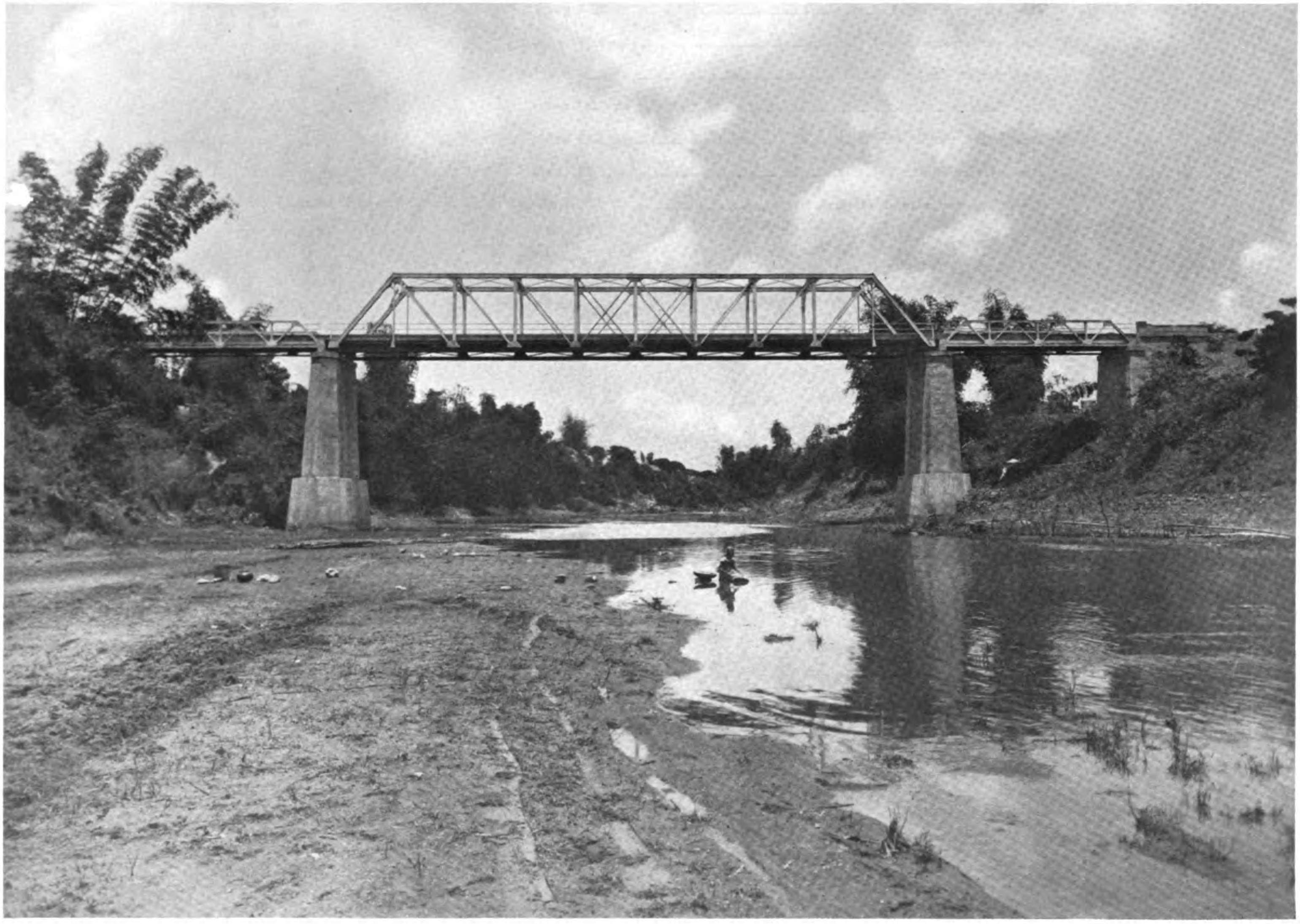
BULLETIN

Vol. 18 JANUARY 1, 1930 No. 1



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SINALANG RIVER BRIDGE, ABRA PROVINCE

CONVERSION TABLE

One peso (₱) = **50 cents, U. S. currency.**
One kilometer (km.) = **0.62 mile.**
One kilogram (kg.) = **2.20 pounds (lbs.).**
One centimeter (cm.) = **0.39 inch.**
One meter (m.) = **3.28 feet.**
One hectare = **2.47 acres.**
One cubic meter (cu. m.) = **1.31 cubic yards.**
One hectare meter per day = **8.107 acre feet per day.**
One liter per second (second liter) = **0.0353 cubic feet per second (cu. sec.) second feet.**

MANILA
BUREAU OF PRINTING
1930

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1929

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, *April 11, 1930*

SIR:

I have the honor to submit herewith the Annual Report of the Bureau of Public Works for the year ending December 31, 1929.

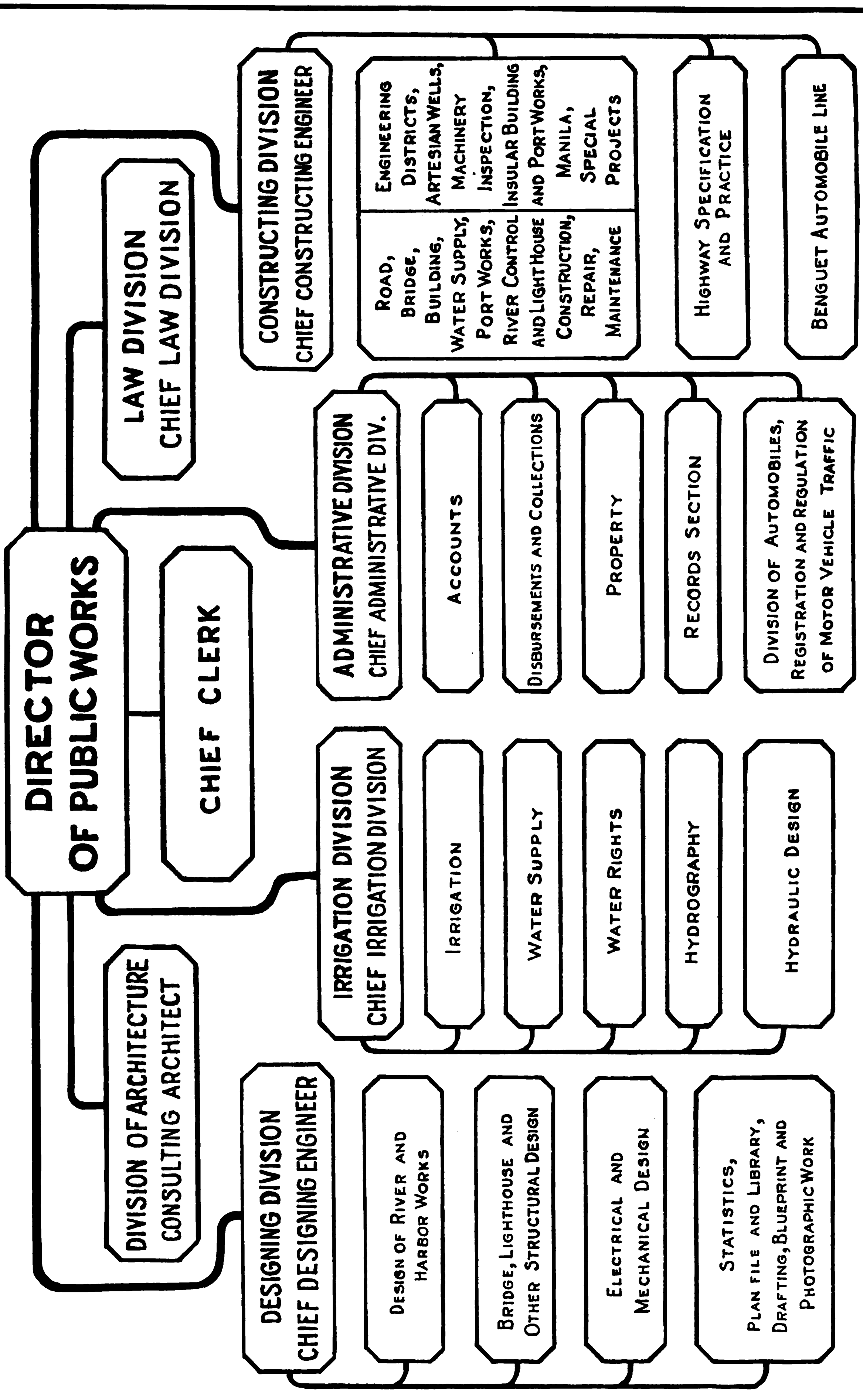
Very respectfully,

A. D. Williams
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.

ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1929.


DIRECTOR OF PUBLIC WORKS
CHIEF CLERK
LAW DIVISION
CHIEF LAW DIVISION
DIVISION OF ARCHITECTURE
CONSULTING ARCHITECT
CONSTRUCTING DIVISION
CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHT HOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE
ADMINISTRATIVE DIVISION
CHIEF ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
IRRIGATION DIVISION
CHIEF IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
DESIGNING DIVISION
CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
STATISTICS, PLAN FILE AND LIBRARY, DRAFTING, BLUEPRINT AND PHOTOGRAPHIC WORK

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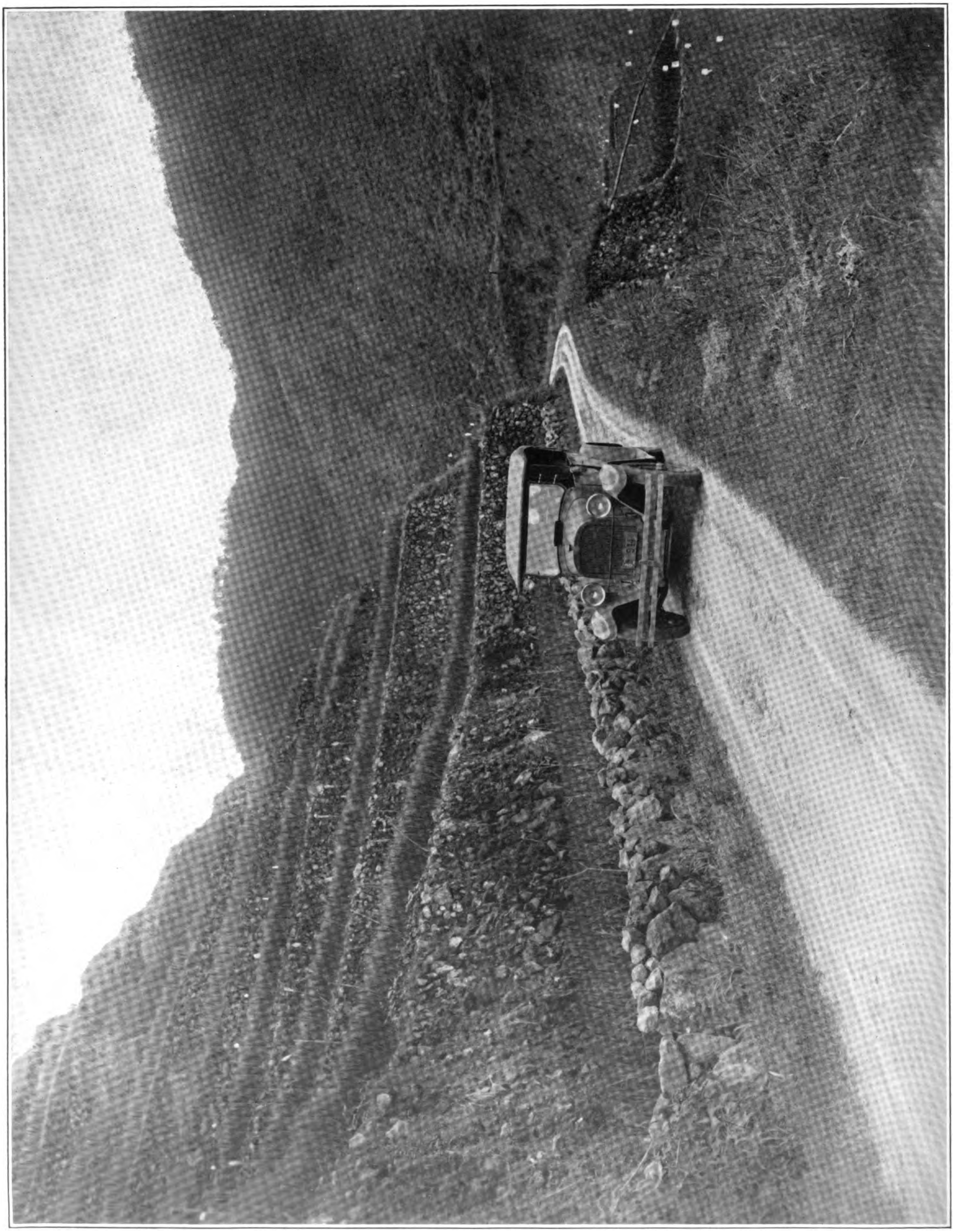


BONTOC-LUBUAGAN ROAD, MOUNTAIN PROVINCE

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and principal functions of the Bureau of Public Works are shown in the organization diagram on page 4. The Philippine Islands are now divided into forty-nine (49) engineering districts which, with the exception of a separate district for the City of Manila, are coextensive with provincial limits. The district engineer is the local representative of the Bureau in each district and is responsible for all activities, excepting the larger irrigation projects, which are constructed by project engineers under the direct supervision of the Manila office. The Central Office in Manila prepares plans and specifications for construction projects and exercises general supervision over all activities of the Bureau.

PERSONNEL

Number of employees paid direct from Bureau and Project Funds as of December 31, 1929: Americans, 13; Filipinos 540.

[NOTE.—The corresponding figures for December 31, 1927, are 14 and 540, respectively.]

Number of technical employees as of December 31, 1929: Americans, 10; Filipinos, 225.

[NOTE.—The corresponding figures for December 31, 1928, are 9 and 217, respectively]

AMERICAN TECHNICAL EMPLOYEES

Position	Permanent	Temporary	Total
Civil engineer	7	0	7
Electrical and mechanical engineer	1	0	1
Surveyor	1	0	1
Architect	1	0	1
Total	10	0	10

FILIPINO TECHNICAL EMPLOYEES

Position	Permanent	Temporary	Total
Civil engineer	47	18	65
Assistant civil engineer	119	16	135
Junior civil engineer	1	0	1
Electrical engineer	2	0	2
Mechanical engineer	2	0	2
Mechanical and electrical engineer	2	0	2
Assistant mechanical engineer	5	0	5
Assistant electrical engineer	2	0	2
Junior mechanical engineer	0	0	0
Junior electrical engineer	0	1	1
Surveyor	5	0	5
Junior surveyor	2	0	2
Supervising architect	1	0	1
Architect	2	0	2
Total	190	35	225

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment (permanent and temporary) engaged upon work supervised by the Bureau by whatever branch of the Government paid:

Changes	Americans	Filipinos	Total 1929	Total 1928
Number of appointments	1	243	244	236
Number of transfers to the Bureau	0	11	11	22
Number of separations for cause	1	17	18	19
Number of voluntary resignations	0	86	86	104
Number of transfers from the Bureau	0	10	10	28
Number of retirements	3	5	8	2
Number of separations due to expiration of employment	0	9	9	1
Number of deaths	0	8	8	6

NOTE.—Item "Number of appointments" includes new and probational appointments.

The activities of the Bureau during 1929 were materially increased on account of the amount of increased appropriations provided for public works. The results obtained during the year are set forth in detail in the following report and tabulations:

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1928 AND 1929

Items	Insular expenditures				Provincial and municipal expenditures		Funds from private sources		Total	
	Bureau of Public Works		Appropriations controlled by other Bureaus							
	1928	1929	1928	1929	1928	1929	1928	1929	1928	1929
	Pesos	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*
Roads, bridges and ferries	125,204.91	129,001.01	90,313.91	24,773.83	13,667,576.60	15,524,554.93	1,287.85	682.75	13,884,383.27	15,679,012.52
Telegraph, telephone and cable lines	526,000.00	448,500.00			31,647.18	7,470.64			557,647.18	450,970.64
Buildings	3,171,317.29	672,192.66	52,859.19	188,516.08	3,010,956.96	3,993,932.22			6.235,133.44	4,854,640.96
Wireless station buildings including towers and masts	35,446.58	170,000.00							35,446.58	170,000.00
Maintenance, alteration and repair of public buildings	436,959.64	422,362.82	136.10	1,265.06	130,764.23	213,572.15			567,859.97	637,200.03
River and harbor works (including lighthouses, buoys, and beacons)	2,667,865.76	1,484,469.53	144,645.53	1,422,281.78	33,861.30	68,240.34	318.93		2,846,691.52	2,974,991.65
Artesian wells and water supply	238,019.59	202,599.12	7,683.89	9,945.61	1,440,810.74	1,489,018.71	14,261.16	7,738.94	1,700,775.38	1,709,302.38
Irrigation projects	119,867.00	114,748.47	1,712,479.03	891,049.10	3.24		214,574.12	184,709.55	2,046,923.39	1,190,507.12
Benguet automobile line	185,410.12	211,629.80							185,410.12	211,629.80
Registration and regulation of motor vehicle traffic	103,040.00	154,500.00							103,040.00	154,500.00
Los Baños quarry	140,000.00	120,000.00							140,000.00	120,000.00
Board of examiners for engineers and architects	3,800.00	3,800.00							3,800.00	3,800.00
Regulation, safeguarding of traffic and collection of tolls on Kennon and Naguilian Roads	13,500.00	13,500.00							13,500.00	13,500.00
Dwellings and equipment for rent in Baguio	44,720.00	49,600.00							44,720.00	49,600.00
Miscellaneous			240,886.45	212,744.19	315,025.32	326,812.73	4,519.78	4,618.54	560,431.55	544,175.46
Totals	7,811,150.89	4,191,903.41	2,249,004.10	2,750,575.65	18,630,645.57	21,623,601.72	234,961.84	197,749.78	28,925,762.40	28,763,830.56

BALANCE SHEET, BUREAU OF PUBLIC WORKS

GENERAL FUND

Assets	1928	1929	Liabilities	1928	1929
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱1,900,842.99	₱1,654,357.86	Accounts payable	₱4,416,670.22	₱4,559,853.05
Cash, collecting and disbursing officer	2,275,095.69	2,145,342.58	Accrued leave payable	217,802.92	239,298.82
Accounts receivable	2,063,956.34	3,202,919.67	Undistributed collections	67,122.64	53,773.28
Supplies and materials	515,583.40	516,769.88	Deferred credit to income	5,309.38	17,452.94
Prepayments	507.82	507.82	Insurance reserve	1,667.87	1,651.48
Work in process	1,131.46	1,803.32	Construction of buildings, etc	473,345.36	608,652.70
			Maintenance, alteration, and repair of public buildings	115,659.83	143,297.01
			Irrigation systems	18,504.92	27,756.45
			Artesian wells and waterworks	66,078.92	63,479.80
			Harbor and river improvement	673,507.07	1,294,059.73
			Roads and bridges	14,416.88	15,415.87
			Telephone, telegraph, cable, etc	613,500.00	350,000.00
Total current assets	6,757,117.70	7,521,700.68	Lighthouse, buoys, and beacons	73,031.69	147,009.50
			Total current liabilities	6,757,117.70	7,521,700.68
FIXED PROPERTY:					
Real property and improvements	51,248,181.94	52,085,392.26			
Equipment	4,222,195.49	4,075,196.99	PRINCIPAL ACCOUNT SURPLUS:		
(Less depreciation)	(908,144.58)	(1,241,306.53)	Fixed property investment	54,562,232.85	54,919,282.72
Total assets	61,319,350.55	62,440,983.35	Total liabilities	61,319,350.55	62,440,983.35

III—MOTOR VEHICLE SPECIAL FUND

Assets	1928	1929	Liabilities	1928	1929
CURRENT:			CURRENT:		
Cash, collecting and disbursing officers	₱3,287.79	₱3,231.17	Accounts payable	₱58,827.89	₱53,624.29
Cash (deposit), Insular Treasury	312,904.82	475,060.52	Accrued leave payable	7,526.42	11,190.80
Accounts receivable	16.32	1,461.74	Undistributed collections	571.98	190,913.31
Supplies and materials	109.90	142.60	Deferred credit to income	186.87	186.87
Prepayments	....	17,089.08	Unappropriated surplus	244,205.67	236,069.84
			Roads and bridges	5,000.00	5,000.00
Total current assets	316,318.83	496,985.11	Total current liabilities	316,318.83	496,985.11
FIXED PROPERTY:					
Equipment	21,438.07	20,584.07	PRINCIPAL ACCOUNTS SURPLUS:		
(Less depreciation)	(1,657.30)	(3,327.28)	Fixed property investment	19,780.77	17,256.79
Total assets	336,099.60	514,241.90	Total liabilities	336,099.60	514,241.90

IV—FIDUCIARY FUND

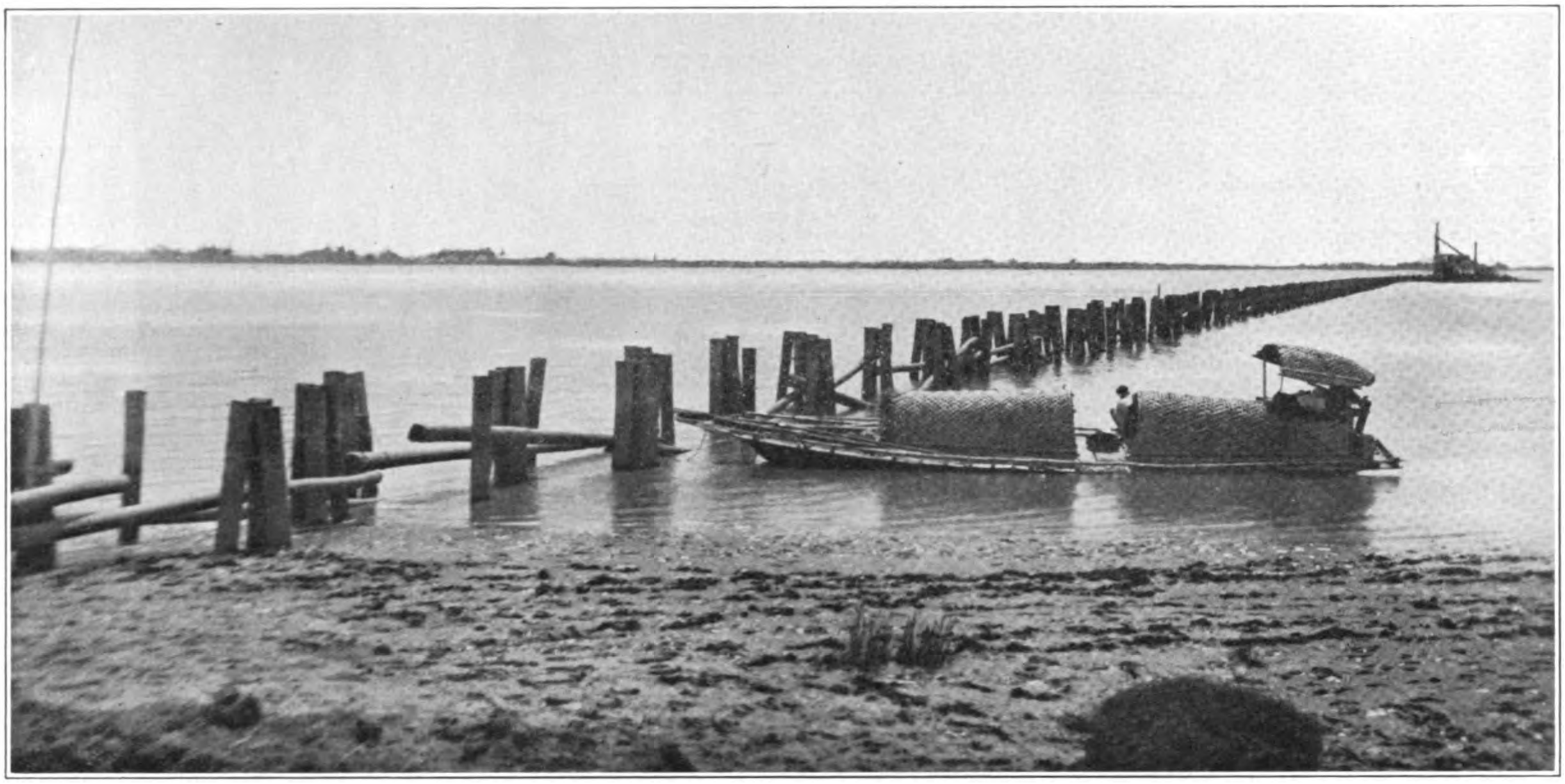
Assets	1928	1929	Liabilities	1928	1929
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱26,385.57	₱24,399.69	Guarantee Fund	₱23,616.22	₱21,685.30
Cash, collecting and Disbursing Officer	....	(1,160.00)	Civil Service Trust Fund	2,769.35	1,554.39
Total current assets	26,385.57	23,239.69	Total current liabilities	26,385.57	23,239.69

V—HIGHWAY SPECIAL FUND

Assets	1928	1929	Liabilities	1928	1929
CURRENT:					
Cash (deposit), Insular Treasury	₱196,790.29	₱189,317.32	Unappropriated Surplus	₱196,790.29	₱189,317.32

VI—BAGUIO DWELLINGS AND EQUIPMENT FOR RENT

Assets	1928	1929	Liabilities	1928	1929
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱69,604.26	₱60,414.03	Accounts payable	₱15,565.08	₱18,000.08
Cash collecting and disbursing officers	2,881.39	10,022.93	Accrued leave payable	215.12	204.35
Accounts receivable	976.30	2,630.16	Undistributed collections	15.86	182.67
			Deferred credit	616.84	944.52
			Insurance reserve to income	....	80.28
Total current assets	73,461.95	73,067.12	Unappropriated Surplus	57,049.05	53,655.22
FIXED PROPERTY:			Total current liabilities	73,461.95	73,067.12
Real property and improvements	627,185.92	627,185.92			
Equipment	141,496.40	148,808.80	PRINCIPAL ACCOUNTS SURPLUS:		
(Less depreciation)	(52,196.38)	(52,989.63)	Fixed property investment	716,485.94	723,005.09
Total assets	789,947.89	796,072.21	Total liabilities	789,947.89	796,072.21



CAGAYAN RIVER HURDLES, CAGAYAN PROVINCE

BALANCE SHEET, BUREAU OF PUBLIC WORKS—Continued

VII—BENGUET AUTOMOBILE LINE

Assets	1928	1929	Liabilities	1928	1929
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱98,421.10	₱158,639.38	Accounts payable	₱31,267.84	₱113,814.82
Cash, collecting and disbursing officers	7,715.04	33,997.82	Accrued leave payable	1,382.42	2,142.56
Accounts receivable	15,779.14	24,041.10	Undistributed collections	146.75	2,868.69
Supplies and materials	85,928.25	45,212.66	Insurance Reserve		6,098.27
			Unappropriated surplus	175,046.52	136,966.62
Total current assets	207,843.53	261,890.96	Total current liabilities	207,843.53	261,890.96
FIXED PROPERTY:					
Real property and improvements		7,700.00	PRINCIPAL ACCOUNTS SURPLUS:		
Equipment	215,620.72	232,902.61	Fixed property investment	154,078.81	141,366.38
(Less depreciation)	(61,541.91)	(99,236.23)			
Total assets	361,922.34	403,257.34	Total liabilities	361,922.34	403,257.34

VIII—IRRIGATION INSURANCE FUND

Assets	1928	1929	Liabilities	1928	1929
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱34,471.39	₱171,072.78	Accounts payable		₱64,026.34
Cash, collecting and disbursing officers	50,541.55	10,486.33	Accrued leave payable		44.42
Accounts receivable		53,601.65	Undistributed collections	₱46,909.82	165,192.22
Supplies and materials		105.24	Tagudin Irrigation System	9,000.00	100.08
			Unappropriated Surplus	29,103.12	5,902.94
Total current assets	85,012.94	235,266.00	Total current liabilities	85,012.94	35,266.00

IX—MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS

Assets	1928	1929	Liabilities	1928	1929
CURRENT:			CURRENT:		
Cash, collecting and disbursing officers	₱60,705.01	₱39,996.63	Accounts payable	₱5,564.36	₱966.63
Cash (overdraft), Insular Treasury	(440,882.17)	(584,281.50)	Accrued leave payable	1,012.77	2,721.92
Accounts receivable	386,754.29	552,849.00	Undistributed collections		2,682.11
Supplies and materials		1,090.00	Unappropriated surplus		3,283.47
Total current assets	6,577.13	9,654.13	Total current liabilities	6,577.13	9,654.13
FIXED PROPERTY:			PRINCIPAL ACCOUNT SURPLUS:		
Real property and improvements	337.37	12,291.49			
Equipment		371.79	Fixed property investment	337.37	12,663.28
Total assets	6,914.50	22,317.41	Total liabilities	6,914.50	22,317.41

BALANCE SHEET, BUREAU OF PUBLIC WORKS—Continued

X—LOS BAÑOS QUARRY, ACT 3459

Assets	1928	1929	Liabilities	1928	1929
CURRENT:			**CURRENT:**		
Cash, collecting and disbursing officers		₱2,492.66	Accounts payable		₱21,341.50
Cash (deposit), Insular Treasury		112,851.53	Accrued leave payable		537.54
Accounts receivable		43,578.05	Unappropriated surplus		138,677.47
Supplies and materials		1,634.27			
Total current assets		160,556.51	Total current liabilities		160,556.51
FIXED PROPERTY:			**PRINCIPAL ACCOUNT SURPLUS:**		
Real property and improvements		27,873.92	Fixed property investment		48,554.76
Equipment		24,484.26			
(Less depreciation)		(3,803.42)			
Total assets		209,111.27	Total liabilities		209,111.27

STATEMENT OF APPROPRIATION, INCOME AND EXPENSES

Debit	1928	1929	Credit	1928	1929
Reversion of unexpended balances of administrative appropriation	₱28,719.67	₱981.29	Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharges collected)	₱955,270.00	₱949,732.00
Reversion receipts	1,174,049.62	1,258,585.06	Receipts—prime cost	7,238,653.15	6,136,681.95
Operating expenditures offset by receipts	7,238,653.15	6,136,681.95	Receipts—surcharges	1,059,952.60	1,163,902.50
Expenditures, administrative appropriation	921,870.33	944,538.71	Receipts—miscellaneous	21,391.81	21,607.37
Outlays, purchase of equipment	4,680.00	4.212.00	Gain on supplies sold	1,123.24	1,052.65
			Inventory adjustments	32,792.85	10,037.78
			Income from rentals	30,200.21	25,277.48
			Sales of fixed assets	849.00	469.79
			Prior year's credit	27,739.91	36,237.49
Total debit	9,367.972.77	8,344.999.01	Total credit	9,367,972.77	8,344,999.01

OPERATION STATEMENT

Operating revenue	1928	1929	Operating expenses	1928	1929
Rental	₱30,200.21	₱25,277.48	Supervising, technical and clerical services (salaries)	₱758,580.55	₱787,256.00
Surcharges	1,059,952.60	1,163,902.50	Labor	46,454.50	46,454.00
Gain on goods sold	1,123.24	1,052.65	Consumption of supplies and materials	42,000.00	40,690.00
Inventory adjustments	32,792.85	10,037.78	Rental of buildings	19,999.93	19,999.92
Sales of fixed assets	849.00	469.79	Illumination and power service	9,000.00	9,000.00
Other service income	21,391.81	21,607.37	Traveling expenses of personnel	21,000.00	21,000.00
Prior year's credit	27,739.96	36,237.49	Repair service	5,000.00	4,500.00
			Postal, telegraph, telephone, and cable service	9,320.00	9,320.00
			Other expenses	7,300.00	11,580.79
			Total operating expenses	918,654.48	949,750.71
			Operating profit	255,395.19	308,834.35
Total	1,174,049.67	1,258,585.06	Total	1,174.049.67	1,258,585.06

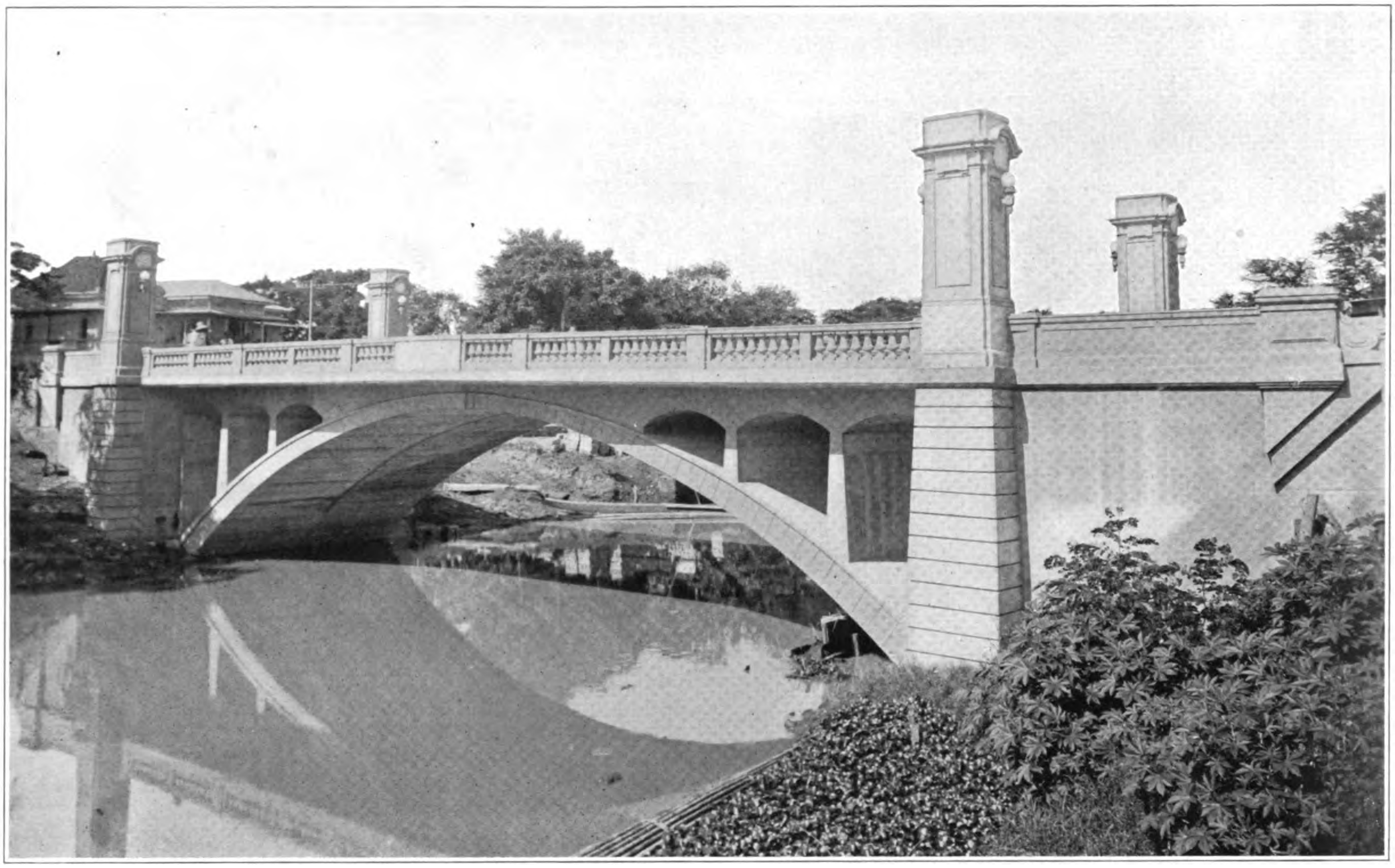
SPECIAL APPROPRIATIONS

Name of activity	Appropriations		Expenditures		Reversion of appropriation		Income	
	Act 3217	Act 3340						
	1928	1929	1928	1929	1928	1929	1928	1929
1. Registration and regulation of motor vehicles	₱103,040.00	₱154,500.00	₱103,040.00	₱154,500.00			₱1,254,684.81	₱1,341,364.17
2. Regulation and safeguarding of traffic and collection of tolls	13,500.00	13,500.00	13,500.00	13,500.00			45,835.75	50,302.75
3. Benguet automobile line	185,410.12	211,629.80	185,410.12	211,629.80			192,437.60	173,521.25
4. Los Baños quarry	140,000.00	120,000.00	140,000.00	120,000.00			103,310.47	138,677.47
5. Board of Examiners for Engineers and Architects	3,800.00	3,800.00	3,800.00	3,800.00			2,810.00	3,680.00
6. Baguio dwellings and equipment for rent	44,720.00	49,600.00	44,720.00	49,600.00			49,962.01	46,206.17
Totals	490,470.12	553,029.80	490,470.12	553,029.80			1,649,040.64	1,753,751.81

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) FROM JANUARY 1 TO DECEMBER 31, 1929

GENERAL FUND

	1928	1929		1928	1929
3. Interbureau transfer	₱210,688.12	₱477,277.34	Principal account surplus from previous year	₱49,865,164.44	₱54,566,421.76
7. Sales	853.90	461.61	1. Purchase	80,841.49	17,207.41
5. Voluntary contributions		38,322.32	2. Construction	4,922,791.76	1,257,020.37
8. Losses (covered by affidavits)	1,649.61	10,942.12	3. Interbureau transfer	1,832.00	
9. Depreciation accruals (including assets dropped on Inventory and Inspection Reports)	297.48		4. Found at station	4,037.47	8,281.79
9-1. Depreciation on ordinary equipment	25,421.75	54,527.04			
9-2. Depreciation on artesian well equipment	47,860.19	52,469.24			
9-3. Depreciation on automobiles and steam wagons	19,974.35	23,431.20			
9-4. Depreciation on port works equipment		252,115.36			
10. Transfers to provinces and municipalities	1,500.00	8,102.86			
11. Inventory adjustment		11,999.52			
Principal account surplus	54,566,421.76	54,919,282.72			
	54.874,667.16	55,848,931.33		54,874.667.16	55,848,931.33



SAN FERNANDO BRIDGE, PAMPANGA PROVINCE

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) FROM JANUARY 1 TO DECEMBER 31, 1929—Continued

III—MOTOR VEHICLE SPECIAL FUND

Assets	1928	1929	Liabilities	1928	1929
3. Interbureau transfer		₱13,365.37	Principal account surplus from previous year	₱12,112.25	₱19,780.77
9-1. Depreciation on ordinary equipment	₱59.94	75.25			
9-3. Depreciation on automobiles and steam wagons	1,597.36	1,599.99			
Principal account surplus	19,780.77	17,256.79	1. Purchase	9,325.82	12,516.63
Total debits	21,438.07	32,297.40		21,438.07	32,297.40

VI—BAGUIO DWELLINGS AND EQUIPMENT

Assets	1928	1929	Liabilities	1928	1929
7. Sales		₱94.36	Principal account surplus from previous year	₱708,249.38	₱716,485.94
8. Losses (covered by affidavits)		80.28	1. Purchase	9,000.00	7,000.00
9-1. Depreciation on ordinary equipment	₱763.44	845.95	4. Found at station		539.74
Principal account surplus	716,485.94	723,005.09			
Total debits	717,249.38	724,025.68		717,249.38	724,025.68

VII—BENGUET AUTO LINE

Assets	1928	1929	Liabilities	1928	1929
3. Interbureau transfer	₱3,232.00		Principal account surplus from previous year	₱148,682.90	₱154,078.81
6. Insurance fund replacement		₱6,000.00			
7. Sales	524.00	709.78	1. Purchase	46,892.62	37,962.50
8. Losses (covered by affidavits)		98.27			
9. Depreciation accruals (including assets dropped on Inventory and Inspection Report)	8,514.29		2. Construction	1,700.00	9,500.00
9-1. Depreciation on ordinary equipment		14,354.37			
9-3. Depreciation on automobiles and steam wagons	27,772.82	44,359.25			
10. Transfers to provinces and municipalities	3,232.30	666.69	4. Found at station	79.00	6,013.43
Principal account surplus	154,078.81	141,366.38			
Total debits	197,354.52	207,554.74		197,354.52	207,554.74

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) FROM JANUARY 1 TO DECEMBER 31, 1929—Continued

IX—MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS

Assets	1928	1929	Liabilities	1928	1929
			Principal account surplus from previous year		₱337.37
			Interbureau transfer		78.99
Principal account surplus	₱337.37	₱12,663.28	Found at station	₱337.37	12,246.92
	337.37	12,663.28		337.37	12,663.28

X—LOS BAÑOS QUARRY, ACT 3459

Assets	1928	1929	Liabilities	1928	1929
			Purchase		₱6,000.00
9-1. Depreciation on ordinary equipment		₱3,803.42	Construction		5,200.00
Principal account surplus		48,554.76	Interbureau transfer		41,158.18
		52,358.18			52,358.18

Catbalogan-North Road, Samar Province

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first class	Kms.	381.9
Reinforced concrete bridges and culverts completed (in this figure, concrete pipe culverts are not included)	Number	87
Successful deep wells completed	do.	82
Reinforced concrete buildings completed (including only buildings of over 100 cubic meters capacity)	Number	132
Waterworks projects completed (total population served, 64,725)	Number	24

EXPENDITURES SUPERVISED DURING THE YEAR 1929 AS COMPARED WITH THE YEAR 1928

Items	1928	1929
Total expenditures	₱28,925,762.40	₱28,768,830.56
Total expended upon road and bridge work	13,884,383.27	15,679,012.52
Total expended upon building work	6,838,439.99	5,661,840.99
Total expended upon port works	2,846,691.52	2,974,991.65
Total expended upon water supply	1,700,775.38	1,709,302.38
Total expended upon irrigation projects	2,046,923.39	1,190,507.12
Operation of automobile line, quarries, and the supervision of motor vehicle traffic	441,950.12	499,629.80
Expenditures on miscellaneous items account for the balance	1,166,598.73	1,048,545.10

REGISTRATION OF MOTOR VEHICLES

During the year ending December 31, 1929, there were 4,938 motor vehicles newly registered and 27,342, re-registered for operation, or a total of 32,280 motor vehicles registered, as compared with 30,046 during 1928. There were also 2,704 motor vehicles registered for storage. During this same period 18,315 applicants for drivers' licenses were examined and 4,965 new licenses issued. Including renewals, 52,921 operators of motor vehicles were licensed during 1929.

The following is a comparative tabulation of motor vehicles registered during the years 1928 and 1929:

Vehicles	1928	1929
Automobiles	19,791	21,341
Motor trucks	9,552	10,365
Motorcycles	703	574
Total	30,046	32,280

The campaign for the apprehension of violators of the Motor Vehicle Law was carried out vigorously through the aid of the Constabulary traffic officers with the result that there were 3,717 licenses suspended and 247 revoked as compared with 3,326 licenses suspended and 222 revoked during 1928. The results of the campaign are as follows:

	Total number of cases reported		Cases for reckless driving		Cases for speeding	
	1928	1929	Number	Per cent	Number	Per cent
First quarter	2,717	1,782	292	16.38	222	12.41
Second quarter	1,636	2,651	476	17.9	319	12
Third quarter	1,672	2,026	383	18.9	371	18.3
Fourth quarter	2,478	2,931	455	15.5	529	18
Total	8,503	9,390	1,606	17.1	1,441	15.3

	1928	1929
Number of deaths caused by automobile accidents reported during the year	32	50
Number of licenses suspended during the year	3,326	3,717
Number of licenses revoked during the year	222	247
Amount of fines in violation of Automobile Law	₱20,972.00	₱25,583.00

Fort Pikit-Kabakan Road, Cotabato Province, under construction

Provisions of the Automobile Law (Act 3045) commonly violated:

	1928	1929
Section 20, overloading	1,957	1,848
Section 26 (*b*), reckless driving	1,163	1,606
Section 26 (*a*), speeding	1,164	1,441
Section 2 (*a*), "colorum"	395	653
Section 34, light	599	500
Section 14 (*h*), driving without license	536	265

COLLECTIONS AND EXPENDITURES

The following tabulation shows the yearly amount of funds collected and expended for the registration and regulation of motor vehicles from 1912 to 1929:

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,392.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	628,918.54	60,000.00
1924	633,214.36	50,000.00
1925	798,438.62	63,025.55
1926	985,561.28	62,555.55
1927	1,145,369.34	83,040.00
1928	1,254,684.81	103,040.00
1929	1,341,364.17	154,500.00

BENGUET AUTOMOBILE LINE

During 1929, the Benguet Automobile Line operated 8 five-passenger Dodge touring cars, 2 five-passenger Dodge Sedan cars, 1 five-passenger Chevrolet touring car, 1 Chevrolet passenger truck, 1 Chevrolet freight truck, 1 seven-passenger Hudson touring car, 2 seven-passenger Studebaker touring cars, 9 White passenger trucks, and 4 White freight trucks; and handled 9,846 full-rate first-class, 475 half-rate first-class, 16,019 full-rate third-class, and 1,733 half-rate third-class passengers; 2,816,505 kilos of express and freight, 11,314 pieces of hand baggage and 123,024 kilos of "dead head" express and freight.

The total gross income during the year amounted to ₱149,221.54, excluding the Manila Railroad Company's collection for the months of August, September, October, November, and December, which, according to a conservative estimate should amount to ₱38,004.38, making the total estimated income ₱187,225.92, as compared to an income in 1928 of ₱197,852.51. The expenditures amounted to ₱126,334.27 as compared to ₱131,456.94 during the previous year. The decreased expenditures were due to a reduction in personnel during the rainy season and to a reduction in the cost of repairing old cars, which were replaced by new cars and trucks that were purchased during the previous year. During the height of the season and Christmas holidays, private automobiles and trucks were hired from local transportation companies and garages in order to handle the large number of passengers and freight.

There were no serious accidents in connection with the operation of the line.

Teacher's Cottage, Pili Agricultural School, Camarines Sur

BAGUIO COTTAGES AND APARTMENTS

The Insular Government cottages and apartments (formerly office buildings) were leased to Government employees and private parties in accordance with the regulations governing same approved under date of January 31, 1929. As in 1928, there was a large demand for these accommodations during the past season. The total income from the cottages and apartments during the year amounted to ₱49,594.89, while the cost of maintaining and operating same was ₱48,341.84. The increase in the cost of maintenance was due to the extensive repairs and painting done during the year on the Public Instruction, Commerce and Police Main, Commerce and Police Wing and Executive Building. Considerable repair work was also done on cottages.

Cagayan Valley Road, Balete–Santa Fe Section

LOS BAÑOS QUARRY

This quarry has been very successfully operated during the year under the charge of Mr. Jose Tiosejo, machinery inspector. The following table shows the results obtained:

FINANCIAL STATEMENT OF LOS BAÑOS QUARRY, DECEMBER 31, 1929

Total cubic meters sold during 1929	₱48,454.00	
Total income during the year		₱188,677.47
Total expenditures including purchase of equipment and construction	117,800.00	
Less cost of capital outlay	9,000.00	108,800.00
Gross profit		29,877.47
Less depreciation based on ₱44,000 value of fixed assets at 20 per cent		8,800.00
Net operating profit		21,077.47

Some difficulty was experienced in delivering rock during the months of November and December as the Manila Railroad Company, on account of the movement of sugar during this period, was not able to furnish a locomotive powerful enough to do the work required.

ORIENTAL–OCCIDENTAL NEGROS INTERPROVINCIAL ROAD, OCCIDENTAL NEGROS

CONSTRUCTING DIVISION

Marcial Kasilag, *Chief Constructing Engineer*

ROADS

Appropriations provided for road and bridge work during the year amounted to ₱16,896,681.82 as compared with ₱16,192,691.49 for the year 1928. Of this sum, ₱7,896,181.82 were derived from general taxation (Provincial Road and Bridge Funds); ₱1,200,000 from collections under Act 3045 (Motor Vehicle Law); ₱4,000,000 from collections under Act 3248 (Gasoline Tax Law); and ₱3,809,500 from Insular appropriations. Collections made under Act 3248 suffered a reduction of ₱500,000, but this reduction was more than covered by an increase of ₱200,000, in collections under Act 3045 and an increase of ₱993,500 in Insular appropriations under Act 3460. Gasoline tax funds amounting to ₱2,000,000 were not released for expenditure until late in December, so that practically all of these funds remained unexpended at the end of the year. Construction work was completed on 380.1 kilometers of first-class roads, 289.0 kilometers of second-class roads and 79.1 kilometers of third-class roads, making the total kilometerage of first, second, and third-class roads on December 31, 1929, 12,640.5. Improved roads of all classes were maintained at a total cost of ₱6,919,183.74, the average cost being ₱842.16 per kilometer for first-class roads and ₱279.24 per kilometer for second and third-class roads.

Six important permanent bridges financed from provincial bond issues, with an aggregate span of 1,016.14 meters, were completed in the provinces of Nueva Ecija, Tarlac, and La Union, respectively, at a total cost of ₱925,044.24. The concrete pavement project on the Manila–North Road in Pampanga province, 25.77 kilometers long, which was financed from provincial bond funds, was also completed, at a total cost of ₱837,280.68.

A total of 181.6 kilometers of old water-bound macadam roads were treated with asphalt, either by the penetration method, or by surface painting, at an average cost of ₱3 per square meter for the penetration method and ₱0.45 per square meter for surface treatment. The funds for this work were largely taken from Insular allotments made to provinces under Acts 3045 and 3248. Wherever asphalt has been used, the maintenance cost has been reduced to approximately 50 per cent of the cost of maintaining the old water-bound macadam roads. This very satisfactory result is encouraging provincial authorities to make an effort to finance the construction of asphalt pavements on all roads subjected to heavy traffic, but the lack of adequate funds continues to be a serious handicap in carrying out this work in a systematic manner. The policy heretofore followed of first asphalting sections of important roads through towns and barrios, in order to eliminate the dust nuisance, has been adhered to.

Considerable work was accomplished on the widening of culverts, bridges and metalling on roads carrying heavy traffic and the construction of by-pass roads around towns to relieve traffic congestion, but much similar work remains to be done to make all roads reasonably safe for the traveling public.

The following tables show the sources of funds provided for road and bridge purposes, the amounts expended for maintenance and construction, the cost of road maintenance in each province, and the average cost of maintaining the different classes of roads during the year:

TABLE I.—FUNDS FOR ROAD AND BRIDGE CONSTRUCTION AND MAINTENANCE

Year	General taxation (Provincial road and bridge funds)	Act 3045 (Automobile registration and license fees)	Insular appropriations	Act 3248, levying a special tax on motor spirits	Total
1922	₱4,469,555.00	₱518,825.85	₱3,245,000.00	....	₱8,233,380.00
1923	3,999,751.00	628,918.54	2,380,000.00	....	7,008,674.54
1924	4,326,878.00	633,214.36	2,400,000.00	....	7,360,092.36
1925	4,406,320.00	798,438.62	2,517,327.00	....	7,722,085.62
1926	5,871,384.99	985,051.28	2,705,000.00	....	9,561,436.27
1927	7,476,690.00	1,145,369.34	4,436,500.00	₱2,926,098.38	15,984,658.55
1928	7,876,691.49	1,000,000.00	2,816,000.00	4,500,000.00	16,192,691.49
1929	7,896,181.82	1,200,000.00	3,809,500.00	4,000,000.00	16,896,691.82

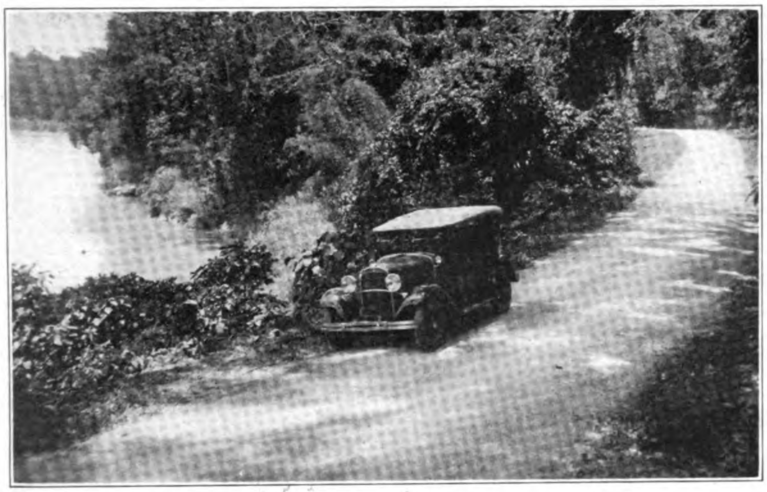
TABLE II.—AMOUNT EXPENDED FOR ROAD AND BRIDGE CONSTRUCTION AND MAINTENANCE

Year	Maintenance	Construction	Total
1922	₱5,050,554.19	₱2,197,565.64	₱7,248,119.83
1923	5,356,230.19	2,007,147.73	7,363,377.92
1924	5,693,466.40	2,619,316.68	8,312,783.08
1925	5,873,078.63	3,545,890.66	9,418,969.29
1926	5,806,013.33	3,689,750.14	9,495,763.47
1927	6,525,639.46	6,006,544.21	12,532,183.67
1928	6,266,100.58	6,572,885,60	12,828,986.17
1929	6,919,183.84	7,633,825.38	14,553,009.12

FORT PIKIT-KABAKAN ROAD, COTABATO PROVINCE

TABLE III.—AVERAGE COST OF MAINTAINING FIRST, SECOND AND THIRD-CLASS ROADS

Provinces	First-class roads			Second and third-class roads			Trails
	Length of first-class roads	Total expenditures for maintenance of first-class roads	Average cost per kilometer of maintenance	Length of second and third-class roads	Total expenditures for maintenance of second and third-class roads	Average cost per kilometer of maintenance	Total expenditures
Abra	74.2	₱33,715.61	₱454.38	72.5	₱3,105.28	₱42.83	₱1,475.91
Agusan	...	...	...	58.3	24,607.94	422.09	...
Albay	231.6	175,973.12	759.81	139.1	19,496.64	140.16	...
Antique	98.7	79,700.10	807.50	103.0	32,526.19	315.79	...
Baguio	61.4	74,410.75	1,211.90	...	...	...	...
Bataan	46.0	95,182.26	2,069.18	134.5	5,400.99	32.72	...
Batanes	...	...	...	...	...	...	18,267.87
Batangas	208.5	103,101.38	494.48	96.9	27,446.06	283.24	...
Benguet	72.4	120,192.19	1,275.92	79.5	5,552.34	69.84	6,975.60
Bohol	260.4	125,449.27	481.76	104.3	54,913.51	526.50	...
Bukidnon	...	...	...	155.4	62,926.86	404.94	...
Bulacan	126.8	203,257.38	1,548.04	187.5	74,413.84	397.40	...
Cagayan	77.0	44,743.13	581.08	245.2	42,026.32	171.40	...
Camarines Norte	40.9	25,010.24	611.49	69.9	8,327.18	119.13	...
Camarines Sur	166.6	155,770.96	935.00	164.6	64,191.95	389.99	...
Capiz	203.2	152,432.15	750,16	68.6	26,274.44	383.00	...
Cavite	100.8	123,831.68	1,228.48	55.5	9,207.30	165.90	...
Cebu	337.3	358,389.93	1,062.53	297.8	126,046.00	423.26	...
Cotabato	27.3	24,981.15	915.06	54.9	9,892.06	180.18	26,396.02
Davao	36.2	50,163.82	1,385.74	45.0	21,540.67	478.68	7,907.55
Ilocos Norte	91.4	50,757.71	555.34	123.5	41,873.09	339.05	...
Ilocos Sur	191.0	157,838.01	826.37	25.9	9,714.46	375.08	13,920.44
Iloilo	309.6	220,199.71	711.24	35.7	3,048.98	85.27	...
Isabela	115.1	74,534.77	647.57	53.0	8,490.12	160.19	...
Laguna	173.0	272,099.44	1,572.83	110.1	28,859.06	262.12	...
Lanao	44.5	45,268.30	1,017.27	120.5	13,089.02	108.62	...
La Union	123.7	54,036.60	521.08	81.5	24,249.40	297.54	2,774.32
Leyte	141.8	202,592.94	1,428.72	193.7	97,651.26	504.13	3,476.18
Marinduque	52.1	27,415.71	526.21	79.3	6,993.37	88.19	...
Masbate	52.5	20,805.07	396.29	25.1	604.62	24.09	...
Mindoro	54.8	42,980.43	784.31	306.9	25,069.41	481.69	...
Misamis	128.4	130,402.34	1,015.59	115.9	46,369.12	400.08	...
Mountain Province	...	...	...	...	...	...	37,911.72
Nueva Ecija	261.2	238,898.43	914.62	39.5	21,024.98	532.28	...
Nueva Vizcaya	81.8	60,297.51	737.12	129.9	26,772.35	206.10	7,608.91
Occidental Negros	392.2	229,155.68	584.29	89.1	47,467.78	532.75	...
Oriental Negros	192.7	139,447.66	732.65	149.0	17,865.85	119.91	...
Palawan	...	...	...	94.8	23,519.57	248.10	...
Pampanga	204.3	185,596.53	908.45	69.8	25,069.45	359.16	...
Pangasinan	520.0	377,066.24	725.13	28.6	9,135.44	319.42	...
Rizal	194.6	316,025.31	1,623.97	19.1	15,927.19	833.83	...
Romblon	...	...	...	142.0	37,736.82	265.82	...
Samar	124.1	66,454.83	535.41	282.9	69,432.00	245.42	...
Sorsogon	163.4	111,069.89	679.74	65.8	24,785.55	376.68	...
Sulu	44.1	33,284.98	754.76	38.4	8,739.55	227.59	11,171.78
Surigao	66.8	49,866.39	746.50	42.1	8,270.31	196.44	...
Tarlac	178.0	107,226.49	602.40	21.0	1,972.27	93.92	...
Tayabas	208.2	180,828.42	868.53	55.8	16,420.44	294.27	...
Zambales	123.1	55,948.44	454.42	20.4	4,091.75	200.58	...
Zamboanga	62.1	47,131.37	758.96	98.9	55,629.34	562.58	...
Total	6,463.8	5,443,534.32	842.16	4,790.7	1,337,763.12	279.24	137,886.30



Cagayan Valley Road, Magapit Mountain Section

DEFINITIONS FOR ROAD CLASSIFICATIONS

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing, their places are supplied by ferries capable of carrying automobiles weighing 2 tons or more. Those roads are continuously passable at all times with possible exceptions during typhoon periods.

Second-class roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the first and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Table IV is a comparative statement of roads in existence in the various provinces during the years 1928 and 1929, showing increase or decrease in each class of roads as of December 31, 1929.

Table V gives the kind of metalling used on existing roads.

TABLE IV.—COMPARATIVE TABLE OF ROADS IN EXISTENCE IN THE VARIOUS PROVINCES DURING THE YEARS 1928 AND 1929

Provinces	First-class roads			Second-class roads			Third-class roads			Trails		
	1928	1929	Increase (or decrease)	1928	1929	Increase (or decrease)	1928	1929	Increase (or decrease)	1928	1929	(Increase or decrease)
	Kms.	*Kms.*	*Kms*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*
Abra	73.2	75.2	2.0	17.5	15.5	(2.0)	13.5	21.9	8.4	101.8	85.7	(16.1)
Agusan	....	....	....	34.0	41.7	7.7	23.6	17.6	(6.0)	23.0	22.3	(0.7)
Albay	231.6	231.6	....	35.9	47.0	11.1	23.8	28.1	4.3	97.3	108.6	11.3
Antique	98.7	98.7	....	115.9	115.9	....	18.4	18.4	....	3.3	3.3	....
Baguio	60.9	62.9	2.0	5.2	5.4	0.2	1.8	1.7	(0.1)	....	....	....
Bataan	45.3	46.7	1.4	17.9	18.2	0.3	2.4	2.4	....	108.3	106.3	(2.0)
Batanes	....	....	....	....	....	....	11.5	13.0	1.5	77.5	86.7	9.2
Batangas	208.5	208.5	....	50.2	73.0	22.8	153.2	143.0	(10.2)	57.7	40.4	(17.3)
Benguet	72.4	74.2	....	156.0	166.5	10.5	14.1	14.4	0.3	229.0	223.6	(5.4)
Bohol	260.4	263.4	3.0	103.6	100.2	(3.4)	59.6	72.2	14.6	20.4	9.0	(11.4)
Bukidnon	....	....	....	103.1	110.6	7.5	60.3	80.4	20.1	54.0	59.9	5.9
Bulacan	122.7	158.3	35.6	138.6	111.3	(27.3)	63.8	63.8	....	....	....	....
Cagayan	74.9	95.7	20.8	126.3	106.9	(19.4)	54.9	74.9	20.0	85.3	109.6	24.3
Camarines Norte	40.9	40.9	....	14.3	22.0	7.7	27.2	33.5	6.3	90.0	82.0	(8.0)
Camarines Sur	162.0	175.1	13.1	66.0	65.6	(0.4)	44.2	45.0	0.8	36.2	31.8	(4.4)
Capiz	204.1	202.3	(1.8)	103.2	112.7	9.5	7.2	50.3	43.1	132.0	88.0	(44.0)
Cavite	100.2	101.3	1.1	47.3	52.2	4.9	4.2	4.2	....	162.5	154.5	(8.0)
Cebu	337.3	337.3	....	294.3	310.3	16.0	92.3	92.3	....	25.0	20.4	(4.6)
Cotabato	27.3	35.9	8.6	15.2	22.2	7.0	29.3	17.4	(11.9)	342.5	330.7	(11.8)
Davao	35.0	37.4	2.4	11.0	14.8	3.8	41.4	46.2	4.8	467.3	465.2	(2.1)
Ilocos Norte	91.4	91.4	....	124.5	151.7	27.2	13.7	27.1	13.4	29.9	43.9	14.0
Ilocos Sur	187.7	196.3	8.6	27.0	67.8	40.8	6.7	12.2	5.5	....	149.7	149.7
Iloilo	309.6	323.0	13.4	78.2	78.5	0.3	133.6	130.4	(3.2)	23.1	12.6	(10.5)
Isabela	102.7	135.9	33.2	52.9	19.4	(33.5)	95.1	95.2	0.1	....	....	....
Laguna	172.6	178.6	6.0	35.0	52.7	17.7	44.1	29.9	(14.2)	8.0	10.3	2.3
Lanao	43.4	50.7	7.3	24.1	24.0	(0.1)	43.0	50.6	7.6	277.9	287.2	9.3
La Union	121.9	141.9	20.0	49.1	52.8	3.7	8.9	8.3	(0.6)	13.0	13.0	....
Leyte	141.8	141.8	....	123.9	146.8	22.9	53.9	47.3	(6.6)	152.7	73.2	(79.5)
Marinduque	51.5	52.6	1.1	40.7	39.6	(1.1)	0.5	13.1	12.6	56.0	39.4	(16.6)
Masbate	44.6	71.2	26.6	17.4	3.5	(13.9)	7.2	1.2	(6.0)	0.6	....	(0.6)
Mindoro	54.8	54.8	....	54.3	70.0	15.7	16.5	15.0	(1.5)	289.4	257.2	(32.2)
Misamis	128.4	128.4	....	120.8	139.3	18.5	49.8	81.9	32.1	127.2	103.6	(23.6)
Mountain Province	....	....	....	221.2	295.1	73.9	96.2	43.7	(52.5)	1,043.2	992.2	(51.0)
Nueva Ecija	261.2	270.5	9.3	38.5	37.5	(1.0)	199.6	225.8	26.2	....	....	....
Nueva Vizcaya	81.8	94.1	12.3	21.7	18.2	(3.5)	46.9	31.7	(15.2)	129.2	129.2	....
Occidental Negros	390.5	426.3	35.8	65.2	90.2	25.0	41.4	43.4	2.0	....	....	....
Oriental Negros	188.0	197.4	9.4	62.6	82.2	19.6	53.2	37.0	(16.2)	133.9	108.2	(25.7)
Palawan	....	....	....	17.1	19.4	2.3	57.4	54.8	(2.6)	74.3	74.3	....
Pampanga	203.9	204.7	0.8	70.2	84.5	14.3	91.6	79.2	(12.4)	....	....	....
Pangasinan	514.9	542.8	27.9	55.8	48.2	(7.6)	145.0	125.9	(19.1)	....	....	....
Rizal	194.4	194.8	0.4	21.6	21.5	(0.1)	43.4	46.4	3.0	12.2	12.3	0.1
Romblon	....	....	....	70.9	99.4	28.5	0.8	1.0	0.2	212.6	185.1	(27.5)
Samar	110.6	137.0	26.4	199.6	180.4	(19.2)	53.9	73.9	20.0	3.5	2.9	(0.6)
Sorsogon	161.5	165.3	3.8	33.4	42.1	8.7	....	9.5	9.5	....	50.7	50.7
Sulu	41.8	53.7	11.9	12.8	6.3	(6.3)	6.8	8.7	1.9	184.5	152.7	(31.8)
Surigao	63.8	73.3	9.5	21.8	22.7	0.9	26.9	25.2	(1.7)	9.4	0.5	(8.9)
Tarlac	178.0	178.0	....	24.3	24.3	....	14.4	14.4	....	....	....	....
Tayabas	205.5	219.5	14.0	68.6	58.4	(10.2)	43.7	51.2	7.5	....	....	....
Zambales	116.2	130.4	14.2	28.0	23.0	(5.0)	9.4	....	(9.4)	20.4	8.4	(12.0)
Zamboanga	62.1	62.1	....	104.0	108.2	14.2	21.3	24.0	2.7	94.2	83.5	(10.7)
Total	6,380.0	6,760.1	380.1	3,340.7	3,629.7	289.0	2,171.6	2,250.7	79.1	5,008.3	4,818.1	(190.2)

NOTE.—Figures in parentheses mean decrease due to either reclassification or remeasurement of roads.

TABLE V.—TYPE OF SURFACING

	December 31, 1928	December 31, 1929	Increase
	Kilometers	*Kilometers*	
Concrete	4.8	30.6	25.8
Asphalt	66.0	247.6	181.6
Macadam stone	1,695.4	1,847.9	152.5
Gravel	4,511.1	4,785.2	274.1
Coral	2,423.8	2,533.1	109.3
Unsurfaced	3,191.2	3,196.1	4.9
Total	11,892.3	12,640.5	748.2

KENNON AND NAGUILIAN ROADS

These Insular roads were maintained at a very reasonable cost and considerable improvement work accomplished. The widening of a section of the Kennon road below the Klondyke Hot Springs, approximately 10 kilometers long, was completed and split curves introduced so as to make provision for two-way traffic. The work of widening a ten kilometer section on the Baguio end of the Naguilian road was also completed and opened to two-way traffic. While the present macadam surfacing was maintained very satisfactorily during the year, the increasing amount of traffic makes it advisable to apply a surface treatment of asphalt as soon as funds can be provided for this work. This improvement would greatly reduce maintenance costs.

The following is a comparative statement of traffic over the Kennon and Naguilian roads for the past three years:

KENNON ROAD

Year	Pedestrians	Bull carts	Animals led	Calesas	Motorcycles	Autos passenger	Autos trucks	Wagons[1]
1927	12,142	2,974	175	....	470	9,317	5,890	33
1928	12,613	4,434	324	....	573	11,198	5,922	....
1929	7,735	1,964	422	....	574	13,028	4,917	66

NAGUILIAN ROAD

Year	Pedestrians	Bull carts	Animals led	Calesas	Motorcycles	Autos passenger	Autos trucks	Wagons[1]
1927	26,765	2,587	2,203	....	34	11,058	7,212	2,422
1928	26,415	1,389	1,851	....	43	14,587	14,260	1,886
1929	15,727	146	654	....	85	19,896	11,602	607

[1] Military wood wagons.

The following is a brief description of the more important road construction projects underway during the year:

Agusan–Surigao Interprovincial Road, Agusan Province.—This road project passes thru rich agricultural lands suitable for the cultivation of hemp and coconuts, and when completed, will be approximately 45.7 kilometers long, connecting the provinces of Surigao and Agusan. During previous years, 10.5 kilometers of this road were graded and during 1929, 7.8 kilometers of the graded portion were surfaced and 2.6 kilometers of new subgrade completed, in addition to the construction of several temporary bridges. The total amount expended during the year was ₱29,807.14.

Ligao–Panganiran Road, Albay Province.—This road is approximately 38 kilometers long and will connect the municipality of Ligao, which is in the central part of Albay, with the southwest coast of the province. In the municipality of Ligao, the road traverses large tracts of lands already planted with hemp and young coconut trees, while near the coast it goes through public lands suitable for agricultural purposes. The work accomplished during the year included 7 kilometers of subgrade, 5 kilometers of metalling, the construction of several temporary wooden bridges and the preliminary survey from Km. 50 to Panganiran Bay. The total expenditure amounted to ₱51,542.04.

Cotabato–Lanao Interprovincial Road, Cotabato Province

Bataan–Zambales Interprovincial Road.—This road when completed will connect the municipality of Dinalupihan in the Province of Bataan with Olongapo, a seaport in the Province of Zambales. It will provide a direct overland route to Manila for the inhabitants of Zambales and western Pangasinan. The Zambales section of this proposed road is 22.2 kilometers long and the Bataan section 19.5 kilometers long. About 6½ kilometers of metalling and 2 kilometers of subgrade were accomplished in the Province of Bataan, at a total cost of ₱43,821.59 and nearly all the remaining subgrade work was completed in Zambales Province, at a cost of ₱24,974.32, during the year.

Batangas–Cavite Interprovincial Road.—This road will connect Tuy, Batangas Province, with Indang, via Mendez, Cavite Province, and will establish a direct route from Manila to western Batangas, following the ridge on the west coast of Lake Taal. The proposed road is 19.1 kilometers long on the Batangas side and 22.2 kilometers on the Cavite side. During the year the section in Batangas was graded to within 2 kilometers of the provincial boundary and 6½ kilometers surfaced. In Cavite, only 2.53 kilometers were added to the subgrade previously accomplished, making a total length of 8.09 kilometers of finished subgrade from Indang toward the boundary. The amount of ₱37,472.45 was expended on the Batangas side, and ₱25,979.18 on the Cavite side.

Loay Interior Road, Province of Bohol.—This project is a coast-to-coast road with the town of Loay as the terminal on the south coast and the barrio of Ipil as the terminal on the north coast of the island. The total length of this project is 79.4 kilometers, 53.8 kilometers of which were completed as first class in previous years. The grading of the remaining 25.6 kilometers, from the Bohol Agricultural Colony to the barrio of Ipil, was completed last year. First course metalling was completed, from Kilometer 72.4 to Kilometer 74, by administration and surfacing materials for kilometers 89.90 and 91 were secured under the "paquiao" system. The total amount expended during the year was ₱24,610.33.

Cagayan Valley Road, Cagayan Province.—This project is approximately 117 kilometers long and work was confined to the construction of the unfinished section from Alcala to Lal-lo, a distance of approximately 45.66 kilometers. During the year 4.09 kilometers of second-class road and 12.5 kilometers of fiirst-class road were completed. In addition, enough crushed rocks to surface three additional kilometers were delivered along the road. The widening of the sections at Kilometers 50, 51, 65, 66, and 74 was also accomplished. Several G. I. pipe culverts were installed and a number of wooden bridges constructed, or reconstructed, during the year. The total expenditure amounted to ₱146,470.42.

Isabela-Lamitan Road, Basilan Island, Zamboanga Province

Cagayan Valley Road, Isabela Province.—This road is approximately 148.9 kilometers long, of which 73.1 kilometers were completed in previous years. The work accomplished on this project is divided into two sections, viz: the Ilagan-Cauayan section 34.8 kilometers long and the Ilagan-Cabagan section, 41.0 kilometers in length. On the former section 24.75 kilometers were completed as first class, including the replacement of all temporary culverts with reinforced concrete pipes and the construction of two, 36-meter, trestle bridges over Bangag Creek and the Balug River respectively. Surfacing material for second and top courses were delivered along the sections of the road which have not been completed as first class.

A considerable amount of work was also accomplished on the Cauayan-Ilagan section, 20 kilometers of which were completed as first class and all temporary culverts were replaced with reinforced concrete pipes. The delivery, spreading and rolling of the third course surfacing for Kilometers 392, 393, 394, 396, 399, and 400 were also completed before the end of the year. The total amount expended for both sections was ₱105,504.80.

Cagayan Valley Road, Nueva Vizcaya Province.—The Nueva Vizcaya section of this road is 103.8 kilometers long, of which 19.8 kilometers between Bayombong and the Nueva Ecija boundary remained unfinished on January 1, 1929. Besides the widening of subgrade in different sections of the road, 12.3 kilometers were constructed as first-class road before the end of the year, leaving only 7.5 kilometers of the road unfinished, near the Nueva Ecija boundary. A timber bridge was constructed over the Abian River and spur dikes in the Magat River at Bayambang to protect the road from erosion. The amount expended during the year totalled ₱94,017.07.

Capiz-Antique Interprovincial Road, Capiz Province.—The length of this project within the limits of Capiz Province is approximately 60.9 kilometers. The section between Banga and Balete was completed as second class and opened to vehicular traffic before the end of the year. In addition to this, approximately 7 kilometers of subgrade, 5 temporary wooden bridges and several concrete pipe culverts have been constructed in other sections of the road. The total expenditure during the year amounted to ₱46,832.11.

Capiz-Iloilo Interprovincial Road.—This road is 30.4 kilometers long on the Iloilo side. On the Capiz side, 6 kilometers of 6-meter subgrade were completed, together with the construction of 3 temporary trestle bridges and two truss bridges, at a total cost of ₱46,832.11. On the Iloilo side, the grading work of the entire road was completed during the year by the "paquiao" system, and the manufacture of concrete pipes was started. The total expenditure on the Iloilo side during the year amounted to ₱23,191.48.

Cotabato-Davao Interprovincial Road.—Of all the interprovincial road projects under construction in the Islands, this one will undoubtedly open up the largest area of rich agricultural lands. The proposed road is 127.4 kilometers long in Cotabato Province and 87.8 kilometers in Davao Province. Of the total amount of ₱25,389.60 expended in Cotabato during the year, ₱6,577.70 were used for the investigation and survey of the section between Pikit and the Davao boundary. The construction work accomplished was the grading of approximately 2½ kilometers of the road, the construction of 4 trestle bridges, and the placing of concrete pipes. With an expenditure on the Davao side of approximately ₱31,628.82, approximately 5 kilometers of subgrade, including the placing of concrete pipes, were completed.

Cotabato-Lanao Interprovincial Road.—The Cotabato section of this road is 58.1 kilometers long and the Lanao section, 105 kilometers. In Cotabato Province, the amount of ₱62,008.70 was expended during the year for constructing 6 kilometers of subgrade; surfacing four kilometers as second class; delivering surfacing materials for 2 kilometers on the road; completion of one-kilometer as first class, and the construction of 5 wooden bridges.

On the Lanao side, ₱29,949.60 were expended for the construction of 10.3 kilometers of subgrade and 17 timber bridges of various spans. Before the end of the year, the section between Tugaya and Ganasi was opened to automobile traffic.

Camarines Norte-Camarines Sur Interprovincial Road.—This road is 16 kilometers long in Camarines Norte and 62 kilometers long in Camarines Sur. The work accomplished during the year in Camarines Norte comprised the clearing and grubbing of 8 kilometers of road way, the construction of 7 kilometers of roadbed, the metalling of a section of approximately 4 kilometers with first-course material and the blasting of boulders and rocks on a section approximately 5 kilometers long. The total sum expended amounted to ₱47,903.06.

Considerable work was accomplished in the Province of Camarines Sur. Of the 25 kilometers which were graded perviously, 22 kilometers were surfaced as second-class road during the year. In addition, the section from Kilometer 26 to Kilometer 40 was cleared. The total amount expended in this province was ₱24,614.86.

Camarines Norte-Tayabas Interprovincial Road.—The combined length of this interprovincial road is 140.6 kilometers—78 kilometers in the Province of Camarines Norte and 62.6 kilometers in Tayabas. The sum of ₱37,569.44 was expended in Camarines Norte for the construction of 5 kilometers of roadbed 5 meters wide, and for widening the 3-meter trail to 5 meters on various sections of the road, totalling approximately 4 kilometers in length.

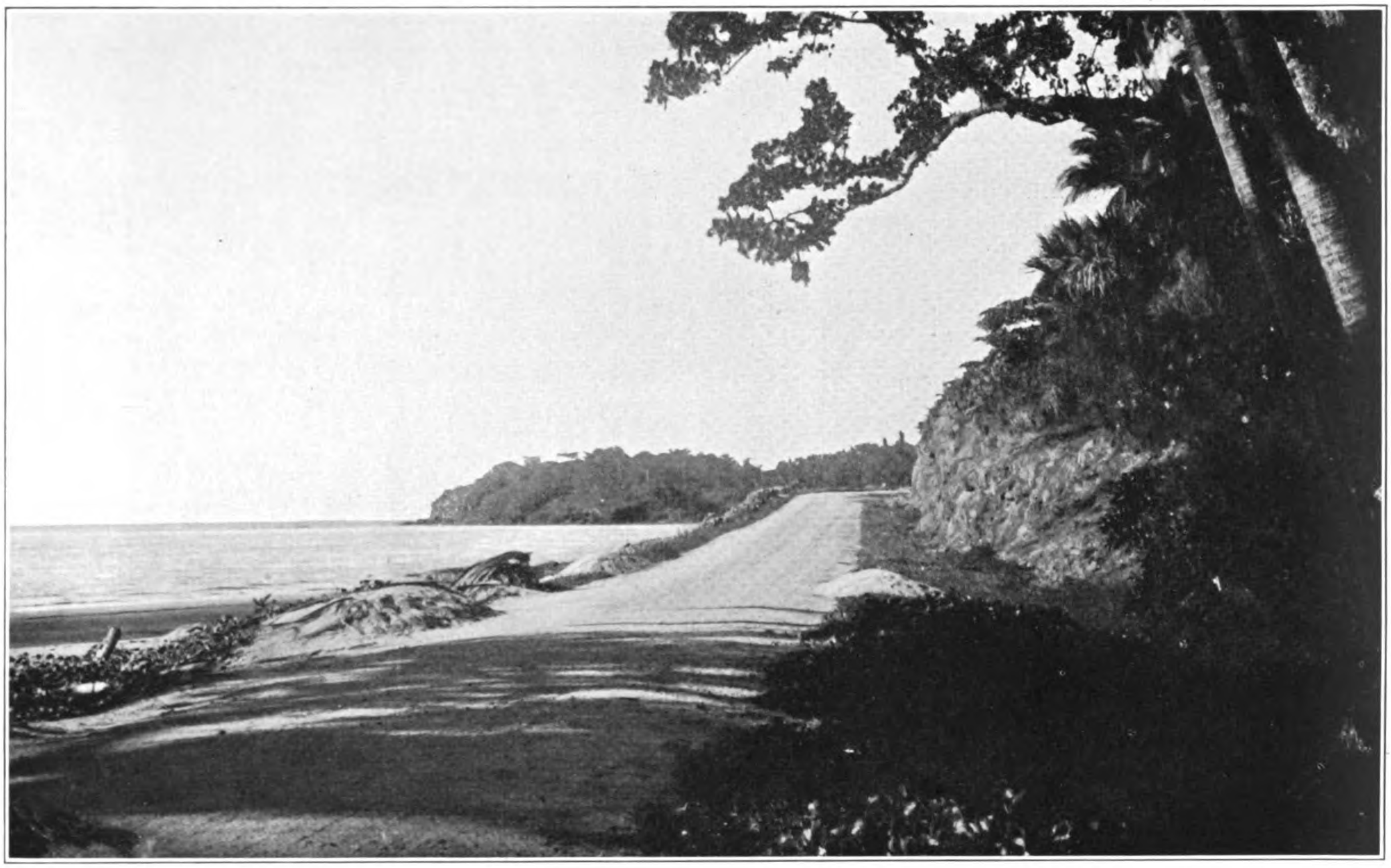
In the Province of Tayabas, the work accomplished was the construction of 1.2 kilometers of roadbed on the Gumaca-Lopez section and 5.3 kilometers on the Sumulong-Viñas section, at a total cost of ₱51,277.75.

Baybay-Abuyog Road.—An appropriation of ₱45,000 was set aside for the construction of this road during the year. Of this amount ₱39,652.31 was expended before the end of the year for surfacing the section from Kilometer 8 to Kilometer 12, inclusive, and for the reconstruction and repair of the road and structures damaged by the flood which occurred during the month of May.

Misamis-Zamboanga Interprovincial Road (Dapitan-Plaridel Section).—This road is 25.22 kilometers long in Misamis Province and 34 kilometers in Zamboanga Province. The amount of ₱24,694.81 was expended in Zamboanga for grading approximately 7 kilometers and for light-surfacing of sections that become muddy under traffic during the rainy season.

In Misamis Province, the sum of ₱21,617.56 was expended for the construction of approximately 14 kilometers of subgrade, one kilometer of which was surfaced as a second-class road.

Occidental Negros-Oriental Negros Interprovincial Road.—In Oriental Negros, this road is 34 kilometers long and the work accomplished was the completion of 11 kilometers of second-class road and the construction of 6 kilometers of new subgrade. The total expenditure during the year amounted to ₱40,256.50.



BAYBAY–CULASI ROAD, CAPIZ PROVINCE

The Occidental Negros section of this road is 37.7 kilometers long all of which was surfaced as second-class road during the year. The total amount expended was ₱43,500.59.

Pampanga Concrete Road, Pampanga Province.—The sum of ₱837,280.68 was expended on this project during the year for constructing 25.77 kilometers of concrete pavement. This work was originally let to contract, but due to the unsatisfactory progress made by the contractor, the contract was cancelled the latter part of January, 1929, and the remainder of the work was carried out by administration.

Taft Avenue Extension, Rizal Province.—This project is 3.34 kilometers long in Rizal Province, and when completed, will greatly relieve the present congestion of traffic on the Manila–south road through Pasay. The whole section was graded during the previous year. During 1929, 2.18 kilometers of the road were completed as a water-bound macadam road with surfacing 10 meters wide. The sum of ₱32,737.67 was expended on this project during the year.

Rizal Avenue Extension, Rizal Province.—The sum of ₱36,968 was expended for asphalting 2.4 kilometers of the Rizal Avenue extension.

Catbalogan–North Road, Samar Province.—This road, when completed, will connect Catbalogan, the Capital of the province, with the municipalities on the north and the northwest coasts of Samar. At the close of the year, 46.5 kilometers were classified as first-class and 41.7 kilometers as second-class road. The expenditure during the year was ₱80,959.97.

The following statement, Table VI, gives a complete list of active road construction projects, by provinces, and shows the status of each project.

TABLE VI.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1929

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure as of December 31, 1929	Expenditure in 1929	Work accomplished		Remarks
								To date	During 1929	
		Kms.						*Pct.*	*Pct.*	
Abra	Peñarubia–Villaviciosa–Pilar Road.	27.00	₱92,000.00	₱86,596.88	₱8,568.00	₱78,505.28	₱15,851.06	85	17	Survey and grading.
Do.	Bangued–La Paz–Lagayan	20.0	51,000.0	50,950.00	13,500.00	45,704.52	8,375.97	90	16	Grading and construction of temporary bridges and concrete culverts.
Do.	Lagangilang–Dolores–San Juan Road.			16,935.00	16,935.00	3,006.74	3,006.74			Survey and grading.
Agusan	Butuan–Nasipit Road	24.0	546,120.00	105,476.07	38,142.00	91,388.60	24,054.53	17	4	Grading, surfacing and construction of temporary bridges.
Do.	Agusan–Surigao Interprovincial Road.	45.7	2,493,000.00	82,438.69	30,000.00	82,214.33	29,807.14	3	1	Do.

TABLE IV—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1929—Continued

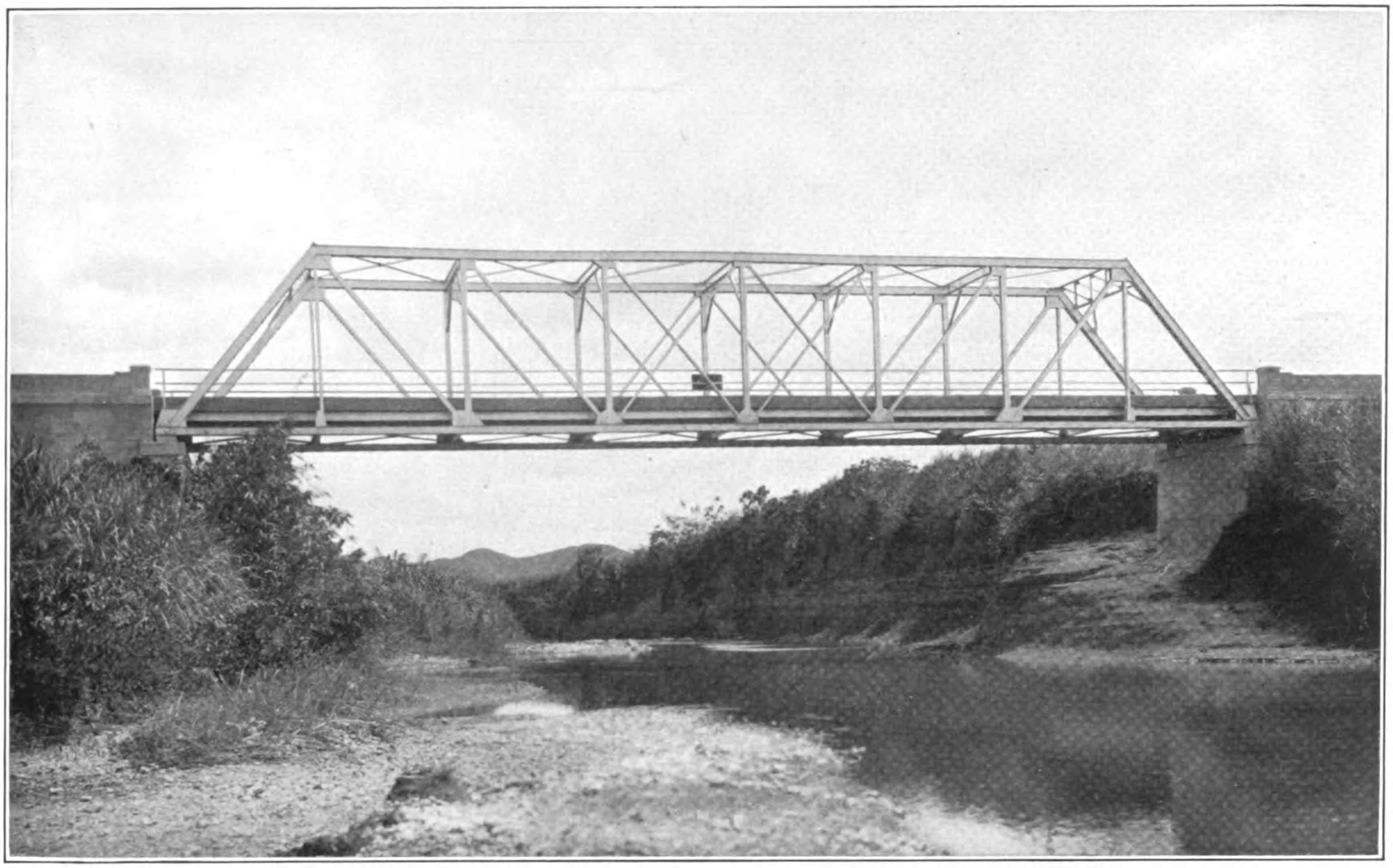
Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure as of December 31, 1929	Expenditure in 1929	Work accomplished		Remarks
								To date	During 1929	
		Kms.						Pct.	Pct.	
Albay	Asphalt pavement		₱40,000.00	₱40,000.00	₱40,000.00	₱39,938.65	₱9,013.81	100	100	Legaspi–Camalig.
Do.	Naga–Joroan Road	6.3	118,200.00	70,177.00	6,000.00	69,491.67	6,522.76	59	6	Grading and construction of temporary bridges.
Do.	Estancia–Malinao Road	8.0	82,700.00	35,014.76	15,000.00	35,014.76	15,029.00	42	18	Grading, surfacing and construction of temporary bridges and concrete culverts.
Do.	Ligao–Panganiran Road	38.0	633,000.00	105,237.94	49,000.00	102,423.86	51,542.04	16	8	Do.
Do.	Legaspi–Manito Road	30.0	209,300.00	85,969.27	20,000.00	83,588.84	30,522.02	40	15	Do.
Do.	Bagacay–Pili Road	4.5	104,100.00	12,500.00	4,000.00	12,455.76	4,132.16	12	4	Do.
Do.	Daraga–Gapo–Baligang–Camalig Road.	10.6	178,200.00	42,050.93	15,218.20	41,670.03	14,605.91	23	8	Grading and surfacing.
Do.	Oas–Libon via Sabang Road	7.1	139,800.00	10,000.00	10,000.00	10,000.00	10,000.00	14	14	Grading and construction of concrete culverts.
Do.	Mauraro–Bololo Road			12,083.63	9,000.00	7,267.71	6,184.10			Survey and grading.
Do.	Taysan–Maslog Road	3.9	28,500.00	5,500.00	4,000.00	5,500.00	5,500.00	19	19	Grading, surfacing and construction of temporary bridges and concrete culverts.
Do.	Barrio Obrero Road	2.0	29,302.00	23,056.87	8,800.00	22,039.86	8,453.74	75	29	Grading and surfacing.
Do.	Pandan–Caramoan Road	9.4	123,500.00	51,562.89	25,086.00	43,694.50	17,541.00	35	14	Grading.
Do.	Viga–Pañganiban–Bagamanoc Road.			47,958.38	20,086.00	31,030.06	10,850.06			Survey and grading.
Do.	Bato–Barras Road	10.2	166,400.00	49,365.63	25,000.00	43,916.57	19,750.23	26	12	Do.
Do.	Cololbon–Codon Road			10,597.00	8,800.00	9,089.01	7,639.31			Grading.
Antique	Asluman–Anini-y Road	25.0	150,000.00	73,340.26	10,000.00	71,226.00	10,795.82	48	7	Grading, surfacing and construction of temporary bridges and concrete culverts.
Do.	Igbalangao–Valderama Road	11.2	445,000.00	47,545.86	10,000.00	43,260.15	17,772.04	30	12	Do.
Bataan	Bataan–Zambales Interprovincial Road.	19.5	313,235.00	201,181.55	43,834.72	201,168.42	43,821.59	64	13	Grading and surfacing.
Do.	Orion–Limay Road	8.1	65,000.00	57,567.96	158.81	57,409.15	153.00	100	12	Do.
Batangas	Lipa–San Jose Road	10.8	70,000.00	29,800.00	7,800.00	29,795.52	23,061.08	48	33	Surfacing.
Do.	Taal–San Nicolas Road	7.0	75,000.00	40,000.00	35,000.00	28,419.64	23,480.67	38	31	Grading and surfacing.
Do.	Alitagtag–San Luis Road	8.9	152,725.00	10,000.00		9,998.00	5,293.98	7	4	Surfacing.
Do.	Tuy–Calatagan Road	28.1	350,000.00	50,719.14	20,000.00	48,509.98	18,722.21	14	5	Grading and surfacing.
Do.	Rosario–Taysan Road	7.4	173,571.00	28,645.33	9,452.00	22,738.60	11,221.81	13	6	Grading, surfacing and construction of temporary bridges.
Do.	Batangas–Cavite Interprovincial Road.	19.1	423,398.00	95,498.70	35,000.00	94,157.91	37,472.45	22	9	Grading, surfacing and construction of concrete culverts.
Do.	Cuenca–Banaybanay Road	8.6	220,740.00	65,378.07	15,000.00	65,246.50	28,396.94	30	13	Surfacing and construction of temporary bridges.
Do.	Bauan–Mabini Road	10.4	173,783.00	49,658.57	19,452.00	43,165.39	28,758.23	25	17	Grading.
Do.	Lipa–Balete Road	11.2	165,668.00	78,209.87		77,236.47	8,691.49	47	5	Grading and surfacing.
Bohol	Inabanga–Jetafe Road	20.8	180,300.00	97,065.32	30,853.84	97,065.32	39,975.23	54	22	Grading, construction of temporary bridges and concrete culverts.
Do.	Batuanan–Ubay Road	20.5	212,000.00	81,066.03	20,000.00	77,817.40	21,086.27	37	10	Do.
Do.	Jagna–Sierra Bullones			37,369.95	20,000.00	34,126.65	16,756.70			Survey and grading.
Do.	Mabini–Pagahot Road			5,940.73	954.22	5,940.73	954.22			Grading.
Do.	Loay–Interior Road	79.4	624,900.00	474,414.18	15,000.00	426,471.47	24,610.33	68	4	Surfacing.
Bukidnon	Bukidnon–Misamis Interprovincial Road.			15,000.00		15,000.00	15,000.00			Surfacing.
Do.	Alae–Libona Road			12,644.00	12,644.00	12,546.89	12,546.89			Grading and construction of temporary bridges.
Bulacan	Sibul–Biaknabato Road	8.2	150,300.00	15,000.00	15,000.00	14,894.52	14,894.52	10	10	Grading.
Do.	Santa Maria–Norzagaray Road	12.8	140,200.00	20,000.00	20,000.00	7,634.93	7,634.93	5	5	Grading and surfacing.
Do.	Dampalit–Pinagkabalian			12,000.00	12,000.00	106.81	106.81			
Cagayan	Cagayan–Valley Road	117.0	1,194,700.00	992,981.23	152,611.46	986,840.19	146,470.42	82	12	Surfacing and construction of temporary bridges and concrete culverts.
Do.	Cagayan–Ilocos Norte Interprovincial Road.	95.0		182,384.35	75,000.00	148,961.45	41,577.10			Grading.
Do.	Cagayan–Mountain Province Interprovincial Road.	68.5		58,262.33	30,000.00	56,209.43	28,244.18			Grading surfacing and construction of concrete culverts.
Do.	Tuguegarao–Peñablanca	8.0	92,900.00	43,163.50	30,000.00	38,896.86	25,788.71	42	28	Do.
Do.	Baybayog–Baggao Road	11.8	128,000.00	78,240.30	58,692.00	36,974.32	17,680.67	29	11	Grading, construction of temporary bridges.
Camarines Norte	Camarines Norte–Camarines Sur Interprovincial Road.	16.0	498,128.00	133,034.66	50,000.00	139,873.22	47,903.06	26	10	Grading, surfacing and construction of concrete culverts.
Do.	Camarines Norte–Tayabas Interprovincial Road.	78.0	1,366,000.00	106,779.60	35,000.00	105,995.04	37,569.44	8	3	Grading and construction of concrete culverts.
Do.	Labo–Batobalane–Mambulao Road.		333,700.00	191,001.68	18,596.00	187,045.98	16,180.65	56	5	Grading, surfacing, and construction of temporary bridges.
Do.	Daet–Bagasbas Road	3.5	9,000.00	7,000.00	7,000.00	3,038.26	3,038.26	30	30	Grading and construction of concrete culverts.
Camarines Sur	Calabanga–Tinambac Road	19.3	200,000.00	34,111.81	14,108.00	1,883.72	1,883.72	1	1	Grading, surfacing, and construction of temporary bridges and concrete culverts.
Do.	Camarines Sur–Camarines Norte Interprovincial Road.	62.0	1,760,000.00	117,554.73	35,000.00	104,654.47	24,613.86	6	1	Grading and surfacing.
Do.	Naga–Danao Junction Road	17.2	392,700.00	360,376.13		360,255.40	23,130.91	92	6	Surfacing.
Do.	Sagnay–Tiwi Road			30,000.00	30,000.00	32,089.03	18,703.12			Survey, grading and surfacing.
Capiz	Capiz–Antique Interprovincial Road.	60.9	1,162,000.00	170,460.32	42,000.00	170,389.93	46,832.11	15	4	Grading, surfacing and construction of temporary bridges and concrete culverts.
Do.	Capiz–Iloilo Interprovincial Road	30.4	331,680.00	80,745.50	30,000.00	67,160.81	26,388.42	20	8	Grading and construction of temporary bridges and concrete culverts.
Do.	Banga–Libacao Road	18.9	325,843.00	56,136.08	15,000.00	56,121.86	15,627.18	17	5	Do.
Do.	Baybay–Culasi Road	4.4	34,100.00	34,000.00	10,000.00	29,629.77	8,576.19	95	25	Surfacing.
Do.	Cuartero–Dumalag Road	5.6	60,354.00	43,556.00	25,558.00	39,750.38	29,525.29	66	49	Grading, surfacing, and construction of temporary bridges and concrete culverts.
Do.	Panay–Pontevedra	10.5	236,000.00	35,000.00	20,000.00	24,373.71	12,269.48	10	5	Do.
Do.	Mambusao–Jamindan Road	12.9	269,400.00	10,000.00	10,000.00	9,161.68	9,161.68	3	3	Grading and construction of concrete culverts.
Do.	Panitan–Calaan Road	4.4	29,000.00	10,000.00	10,000.00	6,150.23	6,150.23	21	21	Grading and surfacing.
Do.	Bataan–Altavas Road	6.9	195,000.00	8,000.00	8,000.00					Survey.
Cavite	Trias–Amadeo Road			20,148.00	10,000.00	20,054.68	9,938.32			Grading and surfacing.
Do.	Maragondon–Tarnate Road	3.0		10,000.00	10,000.00	3,912.23	3,912.23			Do.
Do.	Cavite–Batangas Interprovincial Road.	22.2	273,300.00	103,260.03	35,000.00	94,112.96	25,979.18	35	10	Do.
Do.	Noveleta–Diversion Road		13,500.00	13,500.00		13,348.02	2,983.26	100	100	Surfacing.
Do.	Amaya–Naic Road	10.1		10,000.00	10,000.00	451.83	451.83			Survey.
Do.	Naic–Sahing Road	4.9	52,700.00	15,596.33	7,339.45	9,865.41	2,364.92	19	4	Grading.
Do.	Buenavista–Halang Road	12.9	181,000.00	30,275.24	7,339.45	29,703.76	7,186.65	16	4	Do.

TABLE VI.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1929—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure as of December 31, 1929	Fxpenditure in 1929	Work accomplished		Remarks
								To date	During 1929	
		Kms.						P.ct.	P.ct.	
Cavite	Tanza–Quintana Road	11.7	₱54,700.00	₱22,018.35	₱9,174.31	₱18,338.23	₱5,596.00	33	10	Grading and surfacing.
Do.	San Nicolas–Molino–Paliparan Road.	16.0		30,275.23	9,174.31	9,174.31	9,174.31			Grading.
Do.	Palubluban–Aliang Road			3,669.72	3,669.72	3,669.72	3,669.72			Do.
Cebu	Logo–Taboilan Road	21.0	272,000.00	260,127.77	42,000.00	247,297.50	45,866.76	91	17	Survey and grading.
Do.	Medellin–Puerto Cawit Road	7.4	50,000.00	42,000.00		42,000.00	22,908.00	84	46	Grading and surfacing.
Do.	Bantayan–Madridejos Road	16.0	40,000.00	18,000.00		18,000.00	2,338.43	45	6	Do.
Do.	Poro–San Francisco Road			20,000.00	10,000.00	10,933.69	3,524.75			Grading.
Do.	Curva–Tindog	2.1	10,000.00	8,420.65	1,701.00	8,420.65	3,583.69	84	36	Grading and surfacing.
Do.	Badian–Alegria		30,000.00	25,000.00	25,000.00	22,974.52	22,974.52	77	77	Grading and construction of concrete culverts.
Cotabato	Lumupog–Bual Road	16.2	165,700.00	135,894.15	32,202.00	117,141.13	38,446.34	71	23	Grading, surfacing and construction of temporary bridges and culverts.
Do.	Cotabato–Lanao Interprovincial Road.	58.1	993,800.00	148,785.55	59,612.00	142,445.29	60,317.70	14	6	Do.
Do.	Cotabato–Davao Interprovincial Road.	127.4	2,150,600.00	63,942.26	25,000.00	63,442.06	25,345.60	3	1	Do.
Davao	Davao–Cotabato Interprovincial Road.	87.8	1,447,200.00	355,366.73	74,207.04	355,275.31	80,722.89	25	6	Do.
Do.	Davao–North Road			145,775.66	10,000.00	145,598.42	13,916.17			Do.
Do.	Cuabo–Mati–Boston Road			255,047.06	18,907.07	255,047.06	18,907.07			Grading and surfacing.
Do.	Taloro–Mintal Road	7.0	85,400.00	30,710.42	30,710.42	17,195.92	17,105.92	24	24	Grading.
Ilocos Norte	Ilocos Norte–Cagayan Interprovincial Road.	107.0	1,200,000.00	490,693.41	55,000.00	489,697.35	61,866.12	41	5	Do.
Do.	Pinili–Banna–Nueva Era Road	30.0		91,929.40	46,536.00	91,875.40	49,857.24			Grading and surfacing.
Do.	Solsona–Kabugao Road			45,320.59	30,000.00	30,293.63	18,414.81			Survey and grading.
Do.	Dackel–a–Danum Road	2.0	23,000.00	16,783.51	2,500.00	16,434.19	2,201.76	71	10	Surfacing.
Do.	Badoc–Diversion Road	4.5		25,000.00	25,000.00	13,037.79	13,037.79			Grading.
Ilcos Sur	Butac–Cervantes Road	40.0		25,423.37	25,000.00	13,321.17	13,321.17			Do.
Do.	Candon–Bauguen	12.4	98,000.00	80,340.19	20,500.00	80,131.76	20,539.31	82	21	Surfacing and construction of temporary bridges and concrete culverts.
Do.	Cabugao–Butac Road	20.00	200,000.00	71,894.55	15,000.00	71,714.22	14,839.54	36	7	Grading, surfacing and construction of temporary bridges and concrete culverts.
Iloilo	Guimbal–Tubuñgan Road	12.5	75,000.00	38,083.66	19,670.00	38,033.12	19,746.53	50	26	Grading and surfacing.
Do.	Janiuay–Lambunao Road	15.0	170,000.00	127,846.13	20,000.00	117,705.06	9,899.59	69	17	Surfacing.
Do.	Barotac–Nuevo–North Road	58.0	655,000.00	237,233.63	40,000.00	236,885.78	90,062.31	36	14	Grading and surfacing.
Do.	San Dionisio–Balasan Road	25.5	257,500.00	92,975.32		88,347.48	16,681.62	34	7	Construction of temporary bridges and concrete culverts.
Do.	Balasan–Carlos Road	13.2	100,000.00	19,500.00	14,000.00	13,629.89	9,035.34	14	9	Grading and surfacing.
Do.	Calinog–Capiz Boundary Road	10.9	146,800.00	55,000.00	30,000.00	47,678.18	23,191.48	33	16	Grading.
Do.	Zaraga–Beach Road	4.0	35,000.00	10,955.95	6,000.00	9,738.20	4,782.25	28	14	Grading and surfacing.
Do.	Lambunao–Calinog Road	9.5	193,700.00	39,460.00		32,789.51	32,259.47	17	17	Grading.
Do.	Asphalt pavement		51,000.00	51,197.20	51,197.20	51,038.98	51,038.98	100	100	Iloilo–Molo.
Do.	do.		120,000.00	36,570.00	36,570.00	27,216.69	27,216.69	23	23	Ledesma streets.
Do.	Tiolas–Sinugbuhan Road	14.0	990,000.00	26,000.00	26,000.00	20,711.63	20,711.63	22	22	Grading.
Do.	Cabatuan–San Miguel Road	10.5	80,000.00	10,000.00	10,000.00	9,985.79	9,985.79	12	12	Do.
Do.	Pavia–San Miguel Road	4.0	25,000.00	10,570.00	10,570.00	5,515.22	5,515.22	22	22	Do.
Isabela	Cagayan–Valley Road	148.9	1,100,000.00	782,692.13	108,985.00	779,211.93	105,504.80	71	10	Surfacing and construction of temporary bridges and concrete culverts.
Do.	Cauayan–Cabanatuan Road	11.5	91,600.00	37,391.11	9,174.31	35,084.08	7,204.29	38	8	Grading, surfacing, and construction of temporary bridges and concrete culverts.
La Laguna	San Pablo–Batangas Boundary Road.	13.0	138,900.00	107,725.75	30,000.00	107,725.00	31,697.00	78	25	Surfacing and construction of temporary bridges and concrete culverts.
Do.	Mabitac–Rizal Boundary Road	12.0	271,500.00	105,664.98	40,000.00	103,102.86	38,340.46	38	14	Grading and surfacing.
Do.	Biñan–Diversion Road	1.7	37,200.00	16,000.00		15,913.76	15,451.93	43	43	Grading.
Do.	Biñan–Beach Road	2.9	9,200.00	8,200.00		8,192.12	801.91	93	8	Do.
Do.	Lipa–Alaminos Road	3.4	69,600.00	10,000.00	10,000.00	9,081.35	9,091.35	13	13	Do.
Do.	Luisiana–Botocan–Dalitawan Road.	6.9	120,400.00	120,423.00	120,423.00	113,611.52	113,611.52	95	95	Grading surfacing.
Lanao	Iligan–Misamis Boundary Road	9.7	45,000.00	45,207.67	30,000.00	37,486.04	22,279.38	95	9	Surfacing and construction of temporary bridges.
Do.	Lanao–Cotabato Interprovincial Road.			186,589.10	63,603.00	181,336.24	58,372.84			Grading, surfacing, and construction of temporary bridges and concrete culverts.
Do.	Overton–Kolambugan Road	39.0	320,000.00	22,852.00	9,249.00	15,514.06	9,759.21	5	3	Grading and construction of temporary bridges.
Do.	Dansalan–Ramain Road	13.0	90,000.00	20,000.00	20,000.00	13,151.10	13,151.21	15	15	Do.
La Union	Balaoan–Santol Road	10.4	73,745.00	22,909.11	315.00	22,855.09	988.44	31	1	Surfacing.
Do.	Bacnotan–Balaoan Road	15.7	278,525.00	168,370.71	50,063.00	166,293.36	65,752.22	60	23	Surfacing and construction of concrete culverts.
Do.	Aringay–Diversion Road	3.2	41,000.00	40,248.00	500.00	39,054.43	1,368.62	100	5	Surfacing.
Do.	La Union–Pangasinan Interprovincial.	4.3	55,000.00	45,000.00	30,000.00	39,352.81	31,829.48	75	40	Surfacing and construction of temporary bridges and concrete culverts.
Do.	Aringay–Beach Road	2.6	15,000.00	3,790.00	3,790.00	1,305.64	1,305.64	15	15	Grading.
Do.	Bauang–Beach Road	1.7	10,000.00	2,500.00	2,500.00	804.09	804.09	8	8	Do.
Leyte	Baybay–Abuyog Road	51.0	505,490.00	301,395.44	45,000.00	294,182.06	39,652.31	58	8	Grading and surfacing.
Do.	Maasin–Matalom Road	25.0	240,500.00	227,395.80	10,000.00	226,393.21	9,297.04	94	4	Surfacing and construction of temporary bridges.
Do.	Dulag–Abuyog Road	24.3	271,500.00	96,847.22		96,784.57	13,830.28	36	5	Surfacing.
Do.	Ormoc–Capoocan–Carigara Road			129,917.76	40,000.00	122,797.83	33,145.18			Grading, surfacing, and construction of concrete culverts and temporary bridges.
Do.	Palumpon–Valencia Road	9.9	165,500.00	53,132.16	30,000.00	51,370.00	45,634.51	31	28	Surfacing and construction of concrete culverts.
Do.	Baybay–Inopacan Road	24.0	200,000.00	45,582.16	5,000.00	39,479.50	6,501.85	20	3	Grading and surfacing.
Do.	Alangalang–San Miguel Road	8.9	113,000.00	20,000.00	20,000.00	1,016.12	1,016.12	1	1	Survey.
Do.	Palo–Pastrana Road	6.5	105,000.00	25,000.00	25,000.00	23,614.51	23,614.51	22	22	Grading and construction of temporary bridges.
Do.	Macrohon–Malibog Road	26.6		15,000.00	15,000.00	14,692.36	14,692.36			Grading, surfacing and construction of temporary bridge and concrete culverts.
Do.	Hinunangan–Hinundayan Road	9.5		15,000.00	15,000.00	4,921.59	4,921.59			Grading and construction of temporary bridges and concrete culverts.
Do.	Cabalian–Labagon Road			10,000.00	10,000.00	6,567.27	6,567.27			Grading and construction of temporary bridges.
Do.	Palompon–Villaba Road	22.00		10,000.00	10,000.00	8,376.12	8,376.12			Grading.
Do.	Tanauan–Tolosa–Dulag Road	20.6		25,896.00	25,896.00	11,560.97	11,560.97			Surfacing and construction of temporary bridges.

TABLE VI.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1929—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure as of December 31, 1929	Expenditure in 1929	Work accomplished		Remarks
								To date	During 1929	
		Kms.						P.ct.	P.ct.	
Leyte	Hinundayan-Cabalian Road			₱15,000.00	₱15,000.00	₱11,289.43	₱11,289.43			Grading, surfacing and construction of temporary bridges.
Do.	Malitbog-Sogod Road			5,000.00	5,000.00	4,853.23	4,853.23			Grading.
Marinduque	Mogpog-Santa Cruz Road	18.0		28,562.00	28,562.00	27,634.34	27,634.34			Grading and survey.
Do.	Santa Cruz-Torrijos-Malbog Road.	56.8	₱792,000.00	236,575.42	39,000.00	233,414.98	36,360.63	30	5	Grading and surfacing and construction of temporary bridges and concrete culverts.
Do.	Boac-Interior Road	9.5	50,000.00	18,220.00	3,110.00	18,144.68	7,436.52	36	15	Surfacing and construction of temporary bridges.
Masbate	San Jacinto-San Fernando-Butuan Road.		159,700.00	103,278.87	52,406.70	74,720.41	28,848.24	46	15	Grading, surfacing and construction of temporary bridges and concrete culverts.
Do.	Masbate-Dimasalang Road			108,025.59	70,285.86	93,027.08	55,287.85			Do.
Do.	Milagros-Aroroy Road			26,978.00	26,978.00	831.94	831.94			Survey.
Mindoro	Calapan-Pinamalayan Road	68.1	1,391,602.00	485,082.02	52,439.57	472,988.39	40,345.94	34	3	Grading and construction of temporary bridges and concrete culverts.
Do.	Tillic-Lubang-Tagbac Road	15.2		26,865.39	20,227.82	18,055.37	11,417.80			Survey and grading.
Do.	Pola-Jolo Road	12.2	132,839.00	101,425.58	28,236.10	95,497.63	22,308.20	72	17	Surfacing and construction of temporary bridges and construction of concrete culverts.
Do.	Pinamalayan-Bongabon Road	35.5		2,000.00	2,000.00	1,990.02	1,990.02			Survey and grading.
Misamis	Misamis-Lanao Interprovincial Road.	25.5	710,300.00	60,110.31	30,000.00	57,412.23	45,959.52			Grading and construction of temporary bridges.
Do.	Balingasag-Salay Road	14.0	100,000.00	69,013.78	12,158.55	66,411.46	33,070.32			Grading and surfacing.
Do.	Misamis-Agusan Interprovincial Road.			76,500.00	56,500.00	76,266.46	56,286.07			Grading and construction of concrete culverts.
Do.	Alubijid-Initao Road	24.0	200,000.00	86,199.85	44,880.39	85,626.91	45,807.45			Grading, surfacing and construction of concrete culverts.
Do.	Plaridel-Zamboanga Boundary Road.	25.2	557,700.00	80,334.27	25,000.00	65,074.57	37,960.01			Grading and surfacing.
Do.	Misamis-Zamboanga Boundary Road.	44.8		50,000.00	25,000.00	26,374.54	18,753.92			Survey and grading.
Mountain Province	Banawe-Lamut Road			15,000.00	15,000.00	15,000.00	15,000.00			Do.
Nueva Ecija	Nueva Ecija-Tayabas Interprovincial Road.	28.3	1,500,000.00	119,607.10	60,000.00	95,842.79	39,970.40	6	3	Grade.
Do.	Laur Branch Road	9.0	75,000.00	43,076.91	12,500.00	42,694.72	12,230.73	57	16	Grading and surfacing.
Do.	San Leonardo-Papaya Road	14.0	150,000.00	12,786.66	11,050.00	12,561.79	10,987.64	8	7	Grading.
Do.	Valdefuente Road		5,000.00	2,000.00	2,000.00	1,125.74	1,125.74	22	22	Do.
Do.	San Jose-Rizal Road	17.3	120,000.00	14,100.81	11,700.00	13,972.85	11,572.04	12	10	Do.
Do.	Pinagpanaan-Rizal Road	25.7	190,000.00	139,875.18	36,505.00	135,346.65	31,993.71	71	19	Surfacing.
Do.	Muñoz-Lupao Road	20.0	195,000.00	26,186.05	25,304.74	24,192.55	23,311.24	12	12	Grading.
Do.	Pampanga Bridge Approaches	8.4	240,000.00	191,574.00	61,574.00	107,714.16	78,975.12	100	60	Grading and surfacing.
Do.	Cuyapo-Nampicuan Road	6.1	70,000.00	39,710.32	4,850.00	39,520.10	4,665.00	56	7	Do.
Do.	San Jose-Santa Fe Road	50.8	1,900,000.00	1,506,737.17	45,000.00	1,506,277.24	48,171.08	79	3	Do.
Nueva Vizcaya	Bayombong-Nueva Ecija Boundary Road.	49.0	490,000.00	334,776.24	85,133.60	334,585.92	94,017.07	68	19	Grading surfacing and construction of temporary bridges.
Occidental Negros.	La Carlota-La Castellana Road.	21.0	75,000.00	69,728.31	6,000.00	68,416.33	9,273.91	91	12	Surfacing.
Do.	Kabankalan-South Road	31.0	245,000.00	141,519.53	27,000.00	141,453.61	37,821.10	58	15	Grading and surfacing.
Do.	Himamaylan-Carabalan Road	9.0	72,000.00	15,000.00	15,000.00	9,340.19				
Do.	Sagay-Vito Road	6.5	29,000.00	28,112.12	6,000.00	26,962.17	5,175.27	93	7	Surfacing.
Do.	Nueva Estrella-Toboso Road	3.6	25,000.00	14,260.63	4,000.00	14,176.38	4,114.27	57	16	Do.
Do.	Murcia-Mambucal Road	13.5	75,000.00	23,040.82	5,000.00	22,442.61	16,348.05			Grading.
Do.	Valencia-Araal Road		52,500.00	10,000.00	10,000.00	264.91	264.91			Survey.
Do.	Himogaan-Tiglawigan Road	4.0	30,500.00	2,000.00	2,000.00	721.30	721.30	2	2	Grading.
Do.	Mabini-Japitan-Rizal Road	8.0	62,000.00	6,500.00	6,500.00	1,237.82	1,237.82	5	5	Do.
Do.	Cadiz-Mabini Toad	4.7	35,000.00	8,000.00	2,000.00	5,949.90	1,143.70	17	3	Do.
Do.	Binalbagan-Isabela	14.0	110,000.00	93,415.63	26,000.00	93,093.20	33,584.98	85	31	Surfacing.
Do.	Sumag-Abuanan Road	11.8	60,000.00	32,274.30	4,000.00	28,587.65	6,608.47	48	11	Do.
Do.	Pontevedra-Antipolo	10.2	60,000.00	43,700.58	17,000.00	41,855.24	23,824.19	70	39	Do.
Do.	Occidental Negros-Oriental Negros Interprovincial Road	34.7	386,000.00	236,947.54	40,600.00	236,361.17	43,500.59	61	11	Do.
Do.	Binalbagan-Soledad Road	3.2	20,000.00	8,000.00	8,000.00	6,310.72	6,310.72	32	32	Grading.
Do.	La Castellana-Isabela Road	13.0	99,000.00	85,228.14	12,600.00	85,135.34	30,348.93	100	24	Surfacing.
Do.	Sagay-Bulanon Road	4.5	53,000.00	4,500.00	4,500.00	3,275.99	3,275.99	5	6	Grading.
Oriental Negros	Maria-Talingting Road	10.5	50,000.00	25,195.44	15,195.44	25,194.17	15,195.44	50	30	Grading surfacing and construction of temporary bridge.
Do.	Dumaguete-North Road	117.0	600,000.00	588,445.06	34,138.90	588,445.06	49,624.34	97	8	Grading and surfacing.
Do.	Guihulñgan-Occidental Negros Boundary Road.	34.00	521,700.00	146,480.98	40,180.52	146,480.98	40,256.50	28	8	Surfacing and construction of temporary bridges.
Do.	Zamboanguita-Siaton Road	20.0	361,500.00	74,884.72	42,221.00	74,861.78	42,175.99	21	12	Do.
Do.	Tanjay-Pamplona Road	7.0	51,200.00	51,200.00	7,120.00	51,188.56	7,096.48	100	25	Grading and surfacing.
Palawan	Puerto Princesa-Irahuan Road	14.0	142,421.00	98,956.29	30,069.00	88,896.92	29,691.87	63	21	Do.
Do.	Puerto Princesa-North Road			33,914.00	33,914.00	14,856.33	14,856.33			Survey and grading.
Pampanga	Arayat-Magalang Road	19.0	74,000.00	29,636.74	15,000.00	20,927.39	6,291.70	28	9	Grading and surfacing.
Do.	Concrete Road Pavement	26.8	866,000.00	866,792.40		773,327.86	743,311.65	89	85	25.77 kms. completed.
Do.	Santa Rita-Porac Road	11.5	81,910.00	48,938.66	600.00	47,461.49	10,406.97	58	13	Grading and surfacing.
Pangasinan	Binmaley-San Carlos Road	13.5	163,000.00	90,490.12	33,787.11	90,470.52	33,767.51	56	21	Do.
Do.	Urbiztondo-Mangatarem Road	4.3	268,200.00	20,000.00	20,000.00	9,487.95	9,487.95	4	4	Grading.
Do.	Malasiqui-Villasis Road	19.9	208,800.00	50,181.86	15,026.79	36,898.65	1,743.58	18	1	Surfacing.
Do.	Pangasinan-Zambales Interprovincial Road.	30.0	223,000.00	173,000.06	54,395.14	172,902.91	54,297.99	100	30	Surfacing and grading.
Do.	Rosales-Santa Maria Road	14.5	256,400.00	38,368.56	10,029.10	30,940.48	2,401.02	12	1	Grading.
Do.	Binalonan-San Manuel Road	8.0	54,000.00	34,710.48	19,692.98	30,185.12	15,167.62	100	55	Grading and surfacing.
Do.	San Carlos-Aguilar Road	10.3	364,000.00	19,200.00	15,082.58	12,857.42	8,690.00	4	2	Grading.
Do.	Pangasinan-La Union Interprovincial Road.	10.9	379,000.00	45,005.70	30,009.54	42,102.81	27,106.65	11	7	Grading and surfacing.
Do.	Manaoag-Urdaneta Road	12.0	292,300.00	60,000.00	35,286.52	55,128.34	30,414.86	19	10	Do.
Do.	Bayambang-San Carlos Road			18,000.00	18,000.00	1,237.87	1,237.87			Grading.
Rizal	Rizal Avenue Extension	3.83	150,000.00	156,772.58	55,957.51	137,783.07	36,968.00	100	25	Paving with asphalt.
Do.	Pililla-Quisao-Jalajala Road	16.0	84,000.00	52,089.88	14,225.41	42,808.79	4,944.52	51	6	Surfacing.
Do.	Rizal-Laguna Interprovincial Road.	9.5	168,900.00	107,442.18	44,487.24	103,146.33	40,191.39	62	24	Grading and construction of concrete culverts.
Do.	Taft Avenue Extension	3.34	564,100.00	150,033.94	77,656.49	105,115.12	32,737.67	26	6	Grading and surfacing.
Romblon	Carmen-Odiongan-Alcantara Road.	82.3	1,198,500.00	358,495.30	62,620.00	356,837.69	90,079.07	30	8	Grading and surfacing and construction of temporary bridges.
Do.	Badajoz-Carmen Road	7.4	60,000.00	10,000.00	10,000.00	8,188.60	8 188.60	14	14	Survey and grading.
Do.	San Fernando-Cajidiocan Road	17.0	250,000.00	46,193.44	19,328.35	44,839.98	23,710.46	18	9	Grading, surfacing, and construction of concrete culverts.
Do.	Cajidiocan-Magallanes	35.7		15,000.00	15,000.00	11,718.49	11,718.49			Survey and grading.
Samar	Borongan-South Road	60.2	630,000.00	102,900.35	30,000.00	96,136.29	23,235.94	15	3	Grading and surfacing.
Do.	Catbalogan-North Road	88.2	1,168,000.00	729,921.48	82,933.36	790,948.09	80,959.97	68	7	Do.
Do.	Catbalogan-Wright Road	29.0	260,000.00	181,469.02	15,000.00	180,111.97	13,642.95	69	5	Surfacing.



WAHIG RIVER BRIDGE, BOHOL PROVINCE

TABLE VI.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1929—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure as of December 31, 1929	Expenditure in 1929	Work accomplished		Remarks
								To date	During 1929	
		Kms.						*P. ct.*	*P. ct.*	
Samar	Wright-Taft Road	58.0	₱1,732,800.00	₱234,541.45	₱60,108.90	₱228,848.97	₱53,966.42	13	3	Surfacing.
Do.	Borongan-North Road	82.3	500,000.00	136,821.91	55,059.91	121,426.17	39,664.17	24	8	Surfacing and construction of temporary bridges.
Do.	Guiuan-Salcedo Road	17.0	60,000.00	47,648.56	3,000.00	47,218.70	4,570.14	79	8	Surfacing.
Do.	Lavezares-Carangian Road	21.3	418,900.00	33,150.00	30,018.20	33,049.90	29,913.10	8	7	Grading.
Do.	Calbayog-Tinambacan Road	3.4	59,300.00	12,000.00	12,000.00	11,368.52	11,368.52	19	19	Do.
Do.	Oquendo-Catarman Road	67.7	....	25,000.00	25,000.00	22,828.09	22,828.09	....	....	Do.
Do.	Basey-San Antonio Road	9.1	87,500.00	22,000.00	22,000.00	20,480.38	20,480.38	23	23	Do.
Sorsogon	Putiao-Pilar-Donsol Road	30.6	....	78,811.00	25,000.00	63,083.81	18,004.76	....	....	Grading, surfacing and construction of temporary bridges and concrete culverts.
Do.	Gate-Matnog Road	17.2	270,634.00	29,006.00	15,000.00	23,520.11	9,512.84	9	3	Do.
Do.	Juban-Magallanes Road	24.8	312,337.00	40,000.00	10,000.00	38,483.94	25,241.07	12	8	Do.
Do.	Payawin-Prieto Diaz Road	17.0	230,160.00	7,067.53	7,067.53	7,067.53	7,067.53	3	3	Grading.
Sulu	Jolo-Taglibi Road	13.5	194,800.00	63,527.70	14,777.70	....	....	....	....	
Do.	Jolo-Tandu Bato Road	54.6	211,500.00	105,662.24	54,217.00	....	....	....	....	
Surigao	Placer-Bacuag-Gigaquit Road	25.3	300,000.00	266,035.52	96,469.37	265,996.33	95,630.18	88	32	Grading, surfacing and construction of temporary bridges concrete culverts.
Do.	Carrascal-Cantilan-Lanuza Road.	30.4	1,067,453.00	107,572.19	5,000.00	107,572.19	5,642.06	10	....	Grading.
Tarlac	Victoria-Pura Road	6.5	52,258.00	20,000.00	20,000.00	18,853.32	18,853.32	36	36	Grading and surfacing.
Do.	Tarlac-Camiling Road	21.8	170,000.00	163,669.55	13,680.00	155,804.64	14,759.07	97	1	Surfacing.
Tayabas	Gumaca-Pitogo Road	24.6	410,800.00	220,570.54	65,000.00	220,576.34	75,974.08	54	18	Grading, surfacing and construction of temporary bridges.
Do.	Lucban-Sampaloc-Mauban Road.	30.0	569,500.00	525,042.69	30,000.00	523,458.05	42,344.64	100	9	Surfacing.
Do.	Tayabas-Camarines Norte Interprovincial Road.	62.6	967,000.00	126,473.55	49,354.00	126,472.53	51,277.75	13	15	Grading and surfacing.
Do.	Infanta Puerto Real Road	11.0	175,500.00	63,506.28	20,000.00	59,424.72	16,058.44	34	9	Construction of temporary bridges and concrete culverts.
Do.	Tayabas-Nueva Ecija Interprovincial Road.	74.0	2,000,000.00	105,929.43	40,000.00	105,866.27	43,562.19	5	2	Grading.
Do.	Lucena-Dalahican Road	5.5	59,500.00	26,628.30	15,000.00	26,628.30	15,000.00	45	25	Grading and construction of temporary bridges and concrete culverts.
Do.	Tayabas-Pagbilao Road	11.9	....	24,245.67	14,000.00	23,651.99	13,745.99	....	....	Grading.
Do.	Tiaong-Rosario Road	18.4	....	20,000.00	20,000.00	17,356.09	17,356.09	....	....	Do.
Do.	Sumulong-Guinayangan	20.0	....	15,000.00	15,000.00	3,661.79	3,661.79	....	....	Do.

TABLE VI.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1929—Continued

Province	Name of project	Total length	Estimated cast	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure as of December 31, 1929	Expenditure in 1929	Work accomplished		Remarks
								To date	During 1929	
		Kms.						P.ct.	P.ct.	
Zambales	Zambales-Pangasinan Interprovincial Road.	....	₱120,000.00	₱95,000.00	₱25,000.00	₱94,943.57	₱24,974.32	79	21	Grading, surfacing and construction of temporary bridges.
Do	Zambales-Bataan Interprovincial Road.	22.2	1,292,000.00	187,912.35	35,000.00	187,876.93	34,979.93	15	3	Grading and construction of concrete culverts.
Do	Iba-South Road	....	....	109.607.63	15,521.14	109,572.84	15,521.14	....	....	Surfacing and construction of temporary bridges.
Do	Palauig-Mataluis Road	19.6	191,000.00	95,872.00	4,000.00	95,836.49	3,983.52	50	21	Surfacing.
Zamboanga	Dapitan-Misamis Boundary Road.	34.0	350,000.00	81,736.19	25,000.00	81,306.83	24,694.81	23	7	Grading and surfacing.
Do	Bolong-Curuan Road	14.0	200,000.00	116,416.52	28,550.00	113,759.43	34,889.73	57	17	Do.
Do	Pagadian-Misamis Boundary Road.	71.3	....	50,000.00	25,000.00	29,178.85	23,290.43	....	....	Survey and grading.
Do	Isabela-Lamitan Road	27.0	280,000.00	80,442.53	36,753.00	76,741.67	35,784.74	27	13	Survey, grading and surfacing.
Do	San Ramon-Patalon Road	11.5	....	9,000.00	9,000.00	8,925.21	8,925.21	....	....	Grading.

BRIDGES

The following are the more important bridges completed during the year:

Sinalang River Bridge, Abra Province.—The substructure, and 80 per cent of the superstructure, of this bridge were completed prior to 1929. The remaining 20 per cent of the superstructure was finished and the bridge opened to traffic during the early part of the year. This bridge, consisting of one 160-foot and two 53-foot steel spans, with concrete floor, is located on the Ilocos Sur-Abra interprovincial road and will greatly facilitate travel during the rainy season.

Dayhagon Canal Bridge, Cebu Province.—This is a swing bridge composed of two 50-foot steel swing spans with a clearance of 39 feet and 2 inches between piers. It is located at Km. 106 of the Cebu-North road. The steel superstructure, turntable mechanism and other fittings were furnished by the Atlantic, Gulf and Pacific Company. The construction of the substructure and erection of the superstructure was done under contract by Mr. Valeriano Segura, of Cebu. The bridge was completed and opened to traffic on the 29th of October.

Medellin River Bridge, Cebu Province.—This bridge is located at Km. 118 of the Cebu-North road, and consists of a reinforced concrete arch, 16-meters span, with a rise of 3 meters. Construction work is being carried out by the Butuan Saw Mill, Inc., of Cebu, and at the end of the year the bridge was practically completed.

Camp 8 Bridge, Cebu Province.—This bridge is located on the Cebu-Toledo road, and consists of a 16-meter concrete arch with 6-meter clear roadway. Construction work was done by administration and completed in June, 1929.

Mananga River Bridge, Cebu Province.—This bridge is located at Km. 10 of the Cebu-South road and consists of three 150-foot steel truss spans on concrete abutments and piers supported by wooden pile foundations. The construction of this bridge was done under contract by Hoa Hin Co., Inc.—local contractors of Cebu, and the structural steel was furnished by Mr. A. G. Yankey of Manila. The work was started in February and completed in November, 1929.

Rancho River Bridge, Batangas Province.—This spans the Rancho River at Km. 139 of the Cuenca-Banaybanay-Lipa road. It was financed from a loan fund from the Postal Savings Bank. The project was advertised for bids in the early part of the year and the successful bidder, Mr. Marion E. Martin of Manila, carried out construction work in a creditable manner. The bridge is a 100-foot steel truss span and was opened to traffic on October 20, 1929.

Wahig River Bridge, Bohol Province.—This bridge is located at Km. 73, Loay-Interior road, and consists of one 130-foot steel truss span with reinforced concrete floor and abutments. Its construction was contracted to the Butuan Sawmill of Cebu, except the furnishing of the structural steel which was supplied by the Atlantic, Gulf and Pacific Company of Manila. The project was completed and opened to traffic in August.

Loboc River Bridge, Bohol Province.—This bridge is located at Km. 89 of the Bacani-Carmen road, and consists of one 80-foot riveted pony steel truss with reinforced concrete floor and abutments. Construction work was let by contract to Mr. Ignacio Molina of Mabini, Bohol. The structural steel was furnished by the Atlantic, Gulf and Pacific Company. The project was completed and opened to traffic on May 25, 1929.

Tullahan River Bridge, Bulacan Province.—This bridge is located at Km. 9 of the Manila-North road, and consists of three 10-meter spans of reinforced concrete slabs and girders with a clear roadway of 5.50 meters. The work was done by contract within the stipulated time. It was completed and opened to traffic in April, 1929.

Meycauayan River Bridge, Bulacan Province.—This bridge is located at Km. 19 of the Manila-North road, and consists of two 120-foot steel spans on reinforced concrete abutments and a center pier. Construction work was completed by Contractor Feliciano Nable and the bridge opened to traffic during the early part of the year.

Cava River Bridge, La Union Province.—This bridge has eight 9-meter spans of standard reinforced concrete slab and girder superstructure on reinforced concrete piles. It is located at Km. 282 of the Manila-North road. Construction work was accomplished under contract to Messrs. Fukusawa and Ito. This bridge was inaugurated and opened to traffic on March 15, 1929.

Naguilian River Bridge, La Union Province.—This bridge is located on the Bauang-Baguio road, Km. 301, and consists of three 150-foot steel spans on concrete cylinder piers and one reinforced concrete abutment and a wooden approach on the east end of the bridge. The structural steel was furnished by Mr. A. G. Yankey of Manila, and the construction of the substructure and the erection of the steel, was executed under contract by Mr. Tan Samco, also of Manila. Construction work was started in April, 1928, but due to floods in August of that year and to the scarcity of labor during the rainy season, construction work was not finished until the early part of 1929.

Oroquieta River Bridge, Occidental Misamis Province.—This bridge is located on the Misamis-North road, Km. 43, and consists of two 120-foot steel truss spans on concrete abutments and a pier on wooden pile foundations. The furnishing of steel and construction work was accomplished under contract by Mr. Marion E. Martin of Manila. The work was completed and the bridge opened to traffic in April, 1929.

Pampanga River Bridge, Nueva Ecija Province.—This bridge consists of thirteen 150-foot steel truss spans on concrete abutments and piers. This project was started by contractor Juan Ferrer of Manila, but it was found, after a small part of the work had been accomplished, that the contractor would be unable to complete the work within the specified time, making it necessary to annul the contract and complete the structure by administration. The completion of this bridge in September, 1929, eliminated one of the worst stream crossings on the Manila-North road. It is located at Km. 121, near the town of Cabanatuan.

RANCHO RIVER BRIDGE, CUENCA-LIPA ROAD, BATANGAS PROVINCE

Binituan River Bridge, Nueva Ecija Province.—This bridge consists of one 160-foot steel truss span on reinforced concrete abutments and spans the Binituan River at Km. 156 of the Manila–North road. The work was carried out by Mr. Fortunato Concepcion, of Pasig, Rizal, and the bridge was opened to traffic in the third quarter of the year.

Calatrava River Bridge, Occidental Negros Province.—This bridge is located at Km. 62 of the Bacolod–North road, and consists of eight 9-meter slab and girder spans on reinforced concrete piles, with a roadway 4.88 meters in width. It was constructed by administration, as the only bid received was not considered advantageous to the Government. The bridge was completed in the second quarter of the year and opened to traffic in June, 1929.

Danao River Bridge, Occidental Negros Province.—This bridge consists of six 9-meter spans of the standard concrete slab and girder type. It is located on the Bacolod–North road, Km. 101, and was completed and opened to traffic in the early part of the year.

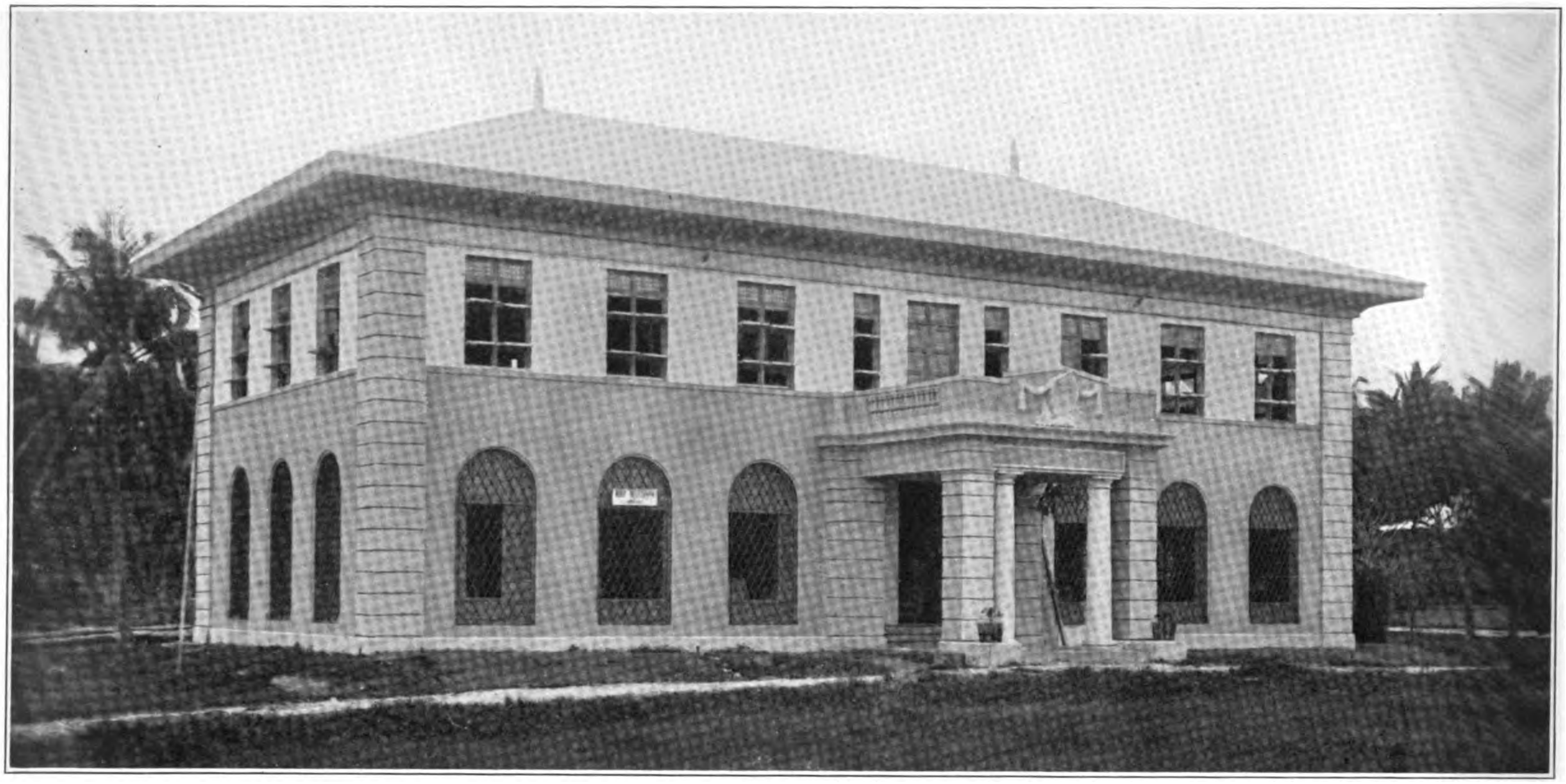
San Fernando River Bridge, Pampanga Province.—This bridge is a 22-meter concrete arch type with wooden foundation piles. It has a clear roadway of 6.00 meters, with one-meter sidewalks on each side. Construction work was started on October 3, 1928, and the bridge was completed, and opened to traffic on February 21, 1929. It is located in the town of San Fernando, Km. 73 of the Manila–Tarlac–North road.

Cut-Cut River Bridge, Tarlac Province.—This bridge is located at Km. 112 of the Manila–Tarlac–North road. It consists of one 160-foot steel span on reinforced concrete abutments, with a clear roadway of 4.88 meters. The fabricated steel was furnished by Mr. A. G. Yankey, and the construction of the substructure and erection of the steel was performed by Messrs. Arranz and Concepcion. The project was completed on February 28, 1929.

Parua River Bridge, Tarlac Province.—This bridge consists of three 130-foot steel spans with concrete piers and abutments and a roadway of 4.88 meters. The construction of this project was carried out by two contractors, namely, Mr. A. G. Yankey, who furnished the fabricated steel, and Mr. Manuel G. Palma, who constructed the substructure and erected the steel superstructure. The bridge was completed and opened to traffic on March 15, 1929. It is located at Km. 104 of the Manila–Tarlac road. The completion of this bridge and the Cut-Cut River Bridge, at Km. 112, on the same road, have eliminated the serious interruptions to traffic between Manila and Tarlac Province which have been experienced during former rainy seasons.

San Isidro River Bridge, Tarlac Province.—This structure, which is located at Km. 159 of the Manila–Tarlac–North road, consists of five 9-meter concrete slab and girder spans on reinforced concrete piles and has a clear roadway of 5.50 meters. It was completed in February, 1929.

Malaking Ilog River Bridge, Tayabas Province.—This bridge is located at Km. 124 of the Candelaria–Bolbok road, over the Malaking Ilog River, at the boundary line between the Provinces of Tayabas and Batangas. It consists of two 100-foot steel truss spans on reinforced concrete abutments and a pier. The contract for the construction of the substructure, reinforced concrete floor slab and erection of the steel superstructure, including painting, was awarded to Mr. Feliciano Nable of Manila while the fabricated steel was furnished by the Atlantic Gulf and Pacific Company. Mr. Nable being unable to complete his part of the work within the contract time, which expired on November 19, 1928, his contract was annulled on February 24, 1929 by the Provincial Board of Tayabas. The work was resumed on February 27, 1929, by administration, and the bridge was completed and opened to traffic on October 21, 1929.



MUNICIPAL BUILDING, BOLBOC, BATANGAS PROVINCE

The following tabulation gives a description and the status of all bridge projects fully or partly completed during the year:

DURABLE BRIDGES AND CULVERTS IN EXISTENCE

Year	All durable structures	
	Total number	Increase during year
1915	6,640	434
1916	7,156	516
1917	7,370	214
1918	7,426	54
1919	7,491	65
1920	7,521	30
1921	7,481	[a]40
1922	7,562	81
1923	7,586	24
1924	7,613	27
1925	7,779	166
1926	7,753	[a]26
1927	7,831	78
1928	7,898	67
1929	8,049	151

[a] Decrease.

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The increase of 151 structures includes those actually completed during the year, as well as those which should have been previously reported, minus structures reported missing for the first time. The above figures are obtained from semi-annual reports of district engineers.

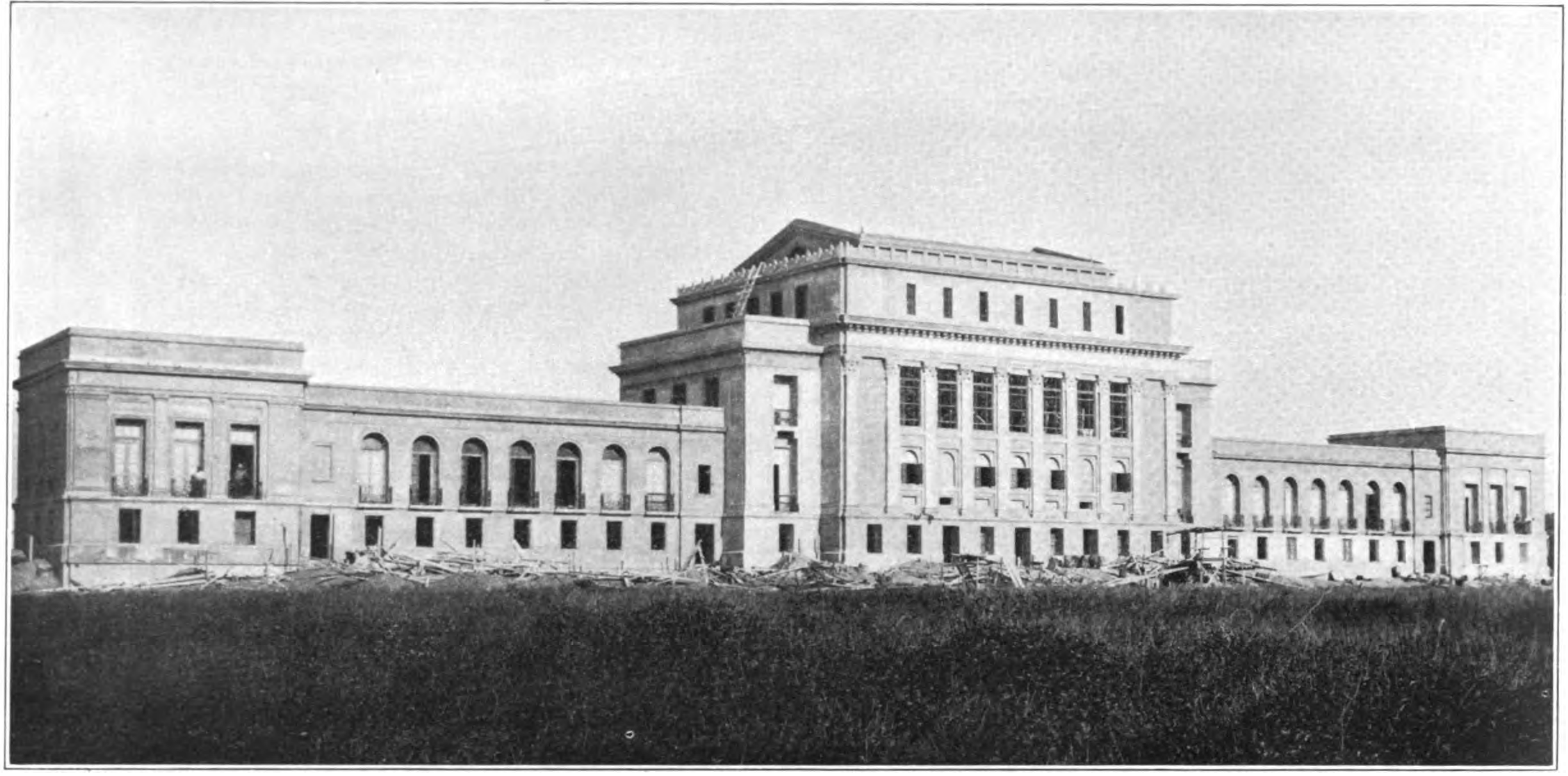
REINFORCED CONCRETE STRUCTURES IN EXISTENCE

Year	Total number	Total span, meters
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,233	18,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280
1922	4,366	17,684
1923	4,400	18,045
1924	4,428	18,413
1925	4,575	18,894
1926	4,597	19,236
1927	4,653	19,664
1928	4,709	20,264
1929	4,882	20,456

NOTE.—All reinforced concrete structures were built under American Administration, together with a large number of steel and other classes of construction.

TABLE VII.—PERMANENT BRIDGES PARTIALLY OR COMPLETELY CONSTRUCTED DURING THE YEAR 1929

Province	Name	Bridge No.	Road	Type	Span in meters	Width of roadway	Estimated cost	Total expenditures to December 31, 1929	Expenditures in 1929	Work accomplished	
										To date	During 1929
Abra	Sinalang River	449.3	Bangued–Tagudin road	Steel truss	1–48.76 2–16.15	4.88	₱160,000.00	₱146,505.47	₱32,134.03	100%	20%
Bataan	Talisay River	130.6	Balanga–South road	Concrete slab and girder.	9– 9.0	4.88	62,000.00	34,979.58	34,979.58	60	60
Batangas	Rancho River	138.7	Cuenca–Banaybanay–Lipa road.	Steel truss	1–30.48	4.88	49,000.00	44,305.58	44,305.58	100	100
Bohol	Wahig River	72.6	Loay–Interior road	do	1–36.58	4.88	60,000.00	55,069.98	35,808.45	100	80
Do	Loboc River	88.5	Bacani–Carmen road	do	1–24.38	4.88	32,000.00	31,662.03	14,926.64	100	53
Bulacan	Tullahan River	8.2	Manila–North road	Concrete slab and girder.	3–10.00	5.50	35,950.00	29,189.00	19,840.86	100	50
Do	Bunlo River	26.5	Manila–North road	do	12.0	5.50	19,543.70	17,556.65	17,556.65	100	93
Do	Meycauayan River	18.8	Manila–North road	Steel truss	2–39.62	4.88	48,367.00	44,002.43	17,776.56	100	45
Do	Malinta	4.7	Malinta–Rizal Avenue	Concrete slab and girder.	2– 5.0 1– 6.0	5.50	5,850.00	4,451.89	1,343.17	100	50



PROVINCIAL CAPITOL BUILDING, BACOLOD, OCCIDENTAL NEGROS

TABLE VII.—PERMANENT BRIDGES PARTIALLY OR COMPLETELY CONSTRUCTED DURING THE YEAR 1929—Continued

Province	Name	Bridge No.	Road	Type	Span in meters	Width of roadway	Estimated cost	Total expenditures to December 31, 1929	Expenditures in 1929	Work accomplished	
										To date	During 1929
Camarines Norte	Linauan River	10.5	Daet–Basud road	do	2– 8.0	4.88	₱16,000.00	₱13,109.48	₱13,109.48	90%	90%
Cebu	Dayhagon Canal	106.0	Cebu–North road	Steel truss (swing).	2–15.24	2.74	60,000.00	40,140.73	40,140.73	100	100
Do	Medellin River	117.8	Cebu–North road	Concrete arch.	16.0	5.50	25,000.00	20,241.86	20,241.86	60	60
Do	Camp 8	28.0	Cebu–Toledo road	do	16.0	6.0	12,000.00	10,000.00	10,000.00	100	52
Do	Mananga River	9.1	Cebu–South road	Steel truss	3–45.72	4.88	150,000.00	132,942.39	132,942.39	100	100
Davao	Davao River	1.0	Davao–South road	do	3–48.76	4.88	177,000.00	68,915.22	68,915.22	40	40
Ilocos Sur	Urzadan River	376.9	Tagudin–Cervantes road	Concrete slab and girder and truss.	2– 9.35 1–48.76	4.88	65,400.00	564.55	564.55	2	2
La Union	Caba River	281.7	Manila–North road	Concrete slab and girder.	8– 9.0	5.50	49,000.00	45,682.52	13,239.17	100	30
Do	Naguilian River	300.6	Bauang–Ribsuan road	Steel truss	3–45.72	4.88	140,000.00	137,423.79	36,578.64	100	35
Misamis	Oroquieta River	42.9	Misamis–North road	do	2–39.62	4.88	80,000.00	79,134.69	41,008.69	100	55
Nueva Ecija	Pampanga River	120.8	Manila–North road	do	13–45.72	4.88	600,000.00	549,471.20	220,248.54	100	70
Do	Binituan River	155.5	do	do	1–48.76	4.88	55,000.00	56,639.37	39,683.82	100	....
Occidental Negros	Talabaan River	62.0	Bacolod–North road	do	1–39.62	4.88	62,500.00	44,654.87	44,529.20	80	80
Do	Calatrava River	132.6	do	Concrete slab and girder.	8– 9.0	4.88	50,000.00	46,861.52	24,756.02	100	75
Do	Danao River	100.7	do	do	6– 9.0	4.88	50,000.00	51,395.84	27,680.99	100	51
Pampanga	San Fernando River	72.2	Manila–Tarlac–North road.	Concrete arch.	22.0	6.00	54,000.00	50,232.44	4,270.07	100	1
Tarlac	Cutcut River	111.6	Manila–Tarlac–North road.	Steel truss	1–48.76	4.88	90,000.00	55,650.86	19,738.68	100	56.5
Do	Parua River	103.6	do	do	3–39.62	4.88	160,000.00	104,885.00	28,305.67	100	39
Do	San Isidro River	158.3	do	Concrete slab and girder.	5– 9.0	5.50	35,000.00	31,980.09	13,024.89	100	42
Do	Tarlac River	134.9	Tarlac–Camiling road	Steel truss	3–45.72	5.50	157,400.00	85,775.02	85,775.02	62.8	62.8
Tayabas	Malaking Ilog	125.3	Candelaria–Bolbok road	do	2–30.48	4.88	108,027.00	102,309.02	73,838.12	100	70

BUILDINGS

MANILA

The following are the more important Insular buildings under construction during the year:

Manila Post Office.—The construction of the foundation for this building was completed in 1921 but further work had to be suspended, due to lack of funds, until February, 1928. Construction work was reported 56 per cent completed at the end of the year and the contractor is expected to complete the project by the end of 1930, or within contract time. The contract price for completing the project, excluding the foundation work accomplished prior to 1928, is ₱1,706,807.99.

University of the Philippines' Library Building.—The University of the Philippines' Library building is a three-story concrete building measuring 41.00 by 33.86 meters out to out. The structure is supported by a wooden pile foundation, and has concrete partitions and flat G. I. roofing. The work was contracted for ₱127,289.86 and at the end of the year the building was about 30 per cent completed.

Male Chronic Pavilion, Psychopathic Hospital.—This project is a two-story concrete building measuring 50.30 by 40.00 by 11.84 meters. The outside walls are of concrete and adobe stone. The floor is of concrete and the roofing corrugated galvanized iron. The work was contracted for ₱165,916.98 and at the end of the year the building was 56 per cent completed.

Four-Room School Building, Placer, Surigao Province

PROVINCES

Construction of a large number of public buildings was undertaken in the provinces during the year, the most important of which are the following:

Tabaco Presidencia Building, Tabaco, Albay Province.—This project is a reinforced concrete two-story building, Davao Type, with outside dimensions of 12.40 by 24.80 meters. Construction work was accomplished under contract for ₱39,500 and the building was completed before the end of the year. The electrical wiring installation was done by the Mora Electric Company for ₱1,025.

Taal Market Building, Type A, Batangas Province.—This was the largest market building project undertaken during the year and consisted of the construction of two market buildings, both of which are 21.0 by 43.5 meters in size, Type A, and one matadero measuring 8.90 by 12.20 meters. The construction of these structures was carried out by contract for ₱43,550.34 and the buildings were completed and turned over to the municipal council of Taal in September, 1929.

Kalibo Hospital, Kalibo, Capiz Province.—This is a one story concrete, 20-bed hospital, 26 by 26 meters, with a kitchen 11 by 11 meters, also of concrete. Twenty per cent of the project was completed during the previous year and the building was completed and turned over to the Health authorities in August 1928.

Vigan Provincial Capitol, Ilocos Sur Province.—This project consists of the reconstruction and remodeling of the old provincial brick building and the construction of two additional concrete wings. The two wings are each 34.25 meters long and 20 meters wide. The construction of the two wings was contracted for ₱98,400, to be completed within 250 calendar days. The work was begun in June and at the end of the year was about 55 per cent finished.

Dumangas School Building, Iloilo Province.—This project consists of the construction of a Bureau of Education Standard Plan No. 10-A concrete building in the municipality of Dumangas, Iloilo. The estimated cost of the project is ₱49,880, but only ₱41,891.58 was made available during the year. The work was started by administration, but had to be suspended, due to lack of funds, after 86 per cent of building had been completed.

Leyte High School Building, Tacloban, Leyte Province.—The Leyte Provincial High School is of the Pasig Type, without the rear wing. Construction work was commenced in December, 1928, under contract, and was completed in July of this year. The total cost of this project up to the end of the year amounted to ₱126,949.60.

Vigan Provincial High School, Ilocos Sur Province.—The Vigan High School is a 20-room building of the 20-room Pasig Type. The construction of the building and the installation of the electrical conduits were executed by contract for ₱93,500 and ₱1,950, respectively. The building was occupied on November 11, 1929.

Bacolod Provincial Capitol Building, Occidental Negros Province.—This project is a special plan two-story concrete building 105.8 meters long by 19 meters wide. Construction was started by contract, but was abandoned by the contractor during the early part of the year and had to be undertaken by administration. At the end of the year the work was about 92 per cent completed and the total amount expended on the project was ₱312,387.36.

Construction of Bicol Leper Station.—This project consists of the construction of one Mess Hall with a floor area of 194 square meters, 2 barracks with a floor area of 116 square meters each, 1 treatment center with a floor area of 99 square meters and 1 kitchen with a floor space of 56 square meters. The construction of these buildings was undertaken by contract for the lump sum of ₱20,090 and at the end of the year the work was about 95 per cent completed.

Table VIII gives a complete list of the school buildings constructed during the year, with their cost and principal dimensions.

Table IX shows the hospital buildings constructed during the year with their cost and principal dimensions.

Table X is a tabulation of market buildings and tiendas constructed with their cost and principal dimensions.

Table XI is a tabulation of presidencia buildings constructed with their cost and principal dimensions.

Table XII is a statement of miscellaneous buildings undertaken during the year.

Provincial Hospital Building, Santa Cruz, Laguna Province

TABLE VIII.—SCHOOL BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Abra	Dolores	1	Brick with G. I. roof (reconstruction)	20.30× 9.30× 6.80	999.6	₱4,077.69
Do.	Bucay	1	Wood with G. I. roof (semipermanent building)	23.80× 9.40× 7.60	1,353.5	3,563.11
Albay	Legaspi	Normal School	Concrete with G. I. roof (wings)	28.20×15.90×10.90 2-9.30×51.20× 7.40	17,874.9	109,466.00
Do.	Guinobatan	1	Concrete and wood with G. I. roof (wings)	12.25×14.35× 7.65	1,389.4	10,215.77
Do.	Bato	1	do	12.25×21.35× 7.65	1,876.2	13,826.64
Do.	Daraga	Extension	Concrete with G. I. roof (Standard Plan No. 10-A).	11.70×14.00× 7.65	1,135.0	9,011.92
Do.	Pantao, Libon	1	Concrete and wood with G. I. roof (Standard Plan No. 10-A).	12.20×14.20× 7.75	1,243.0	6,634.24

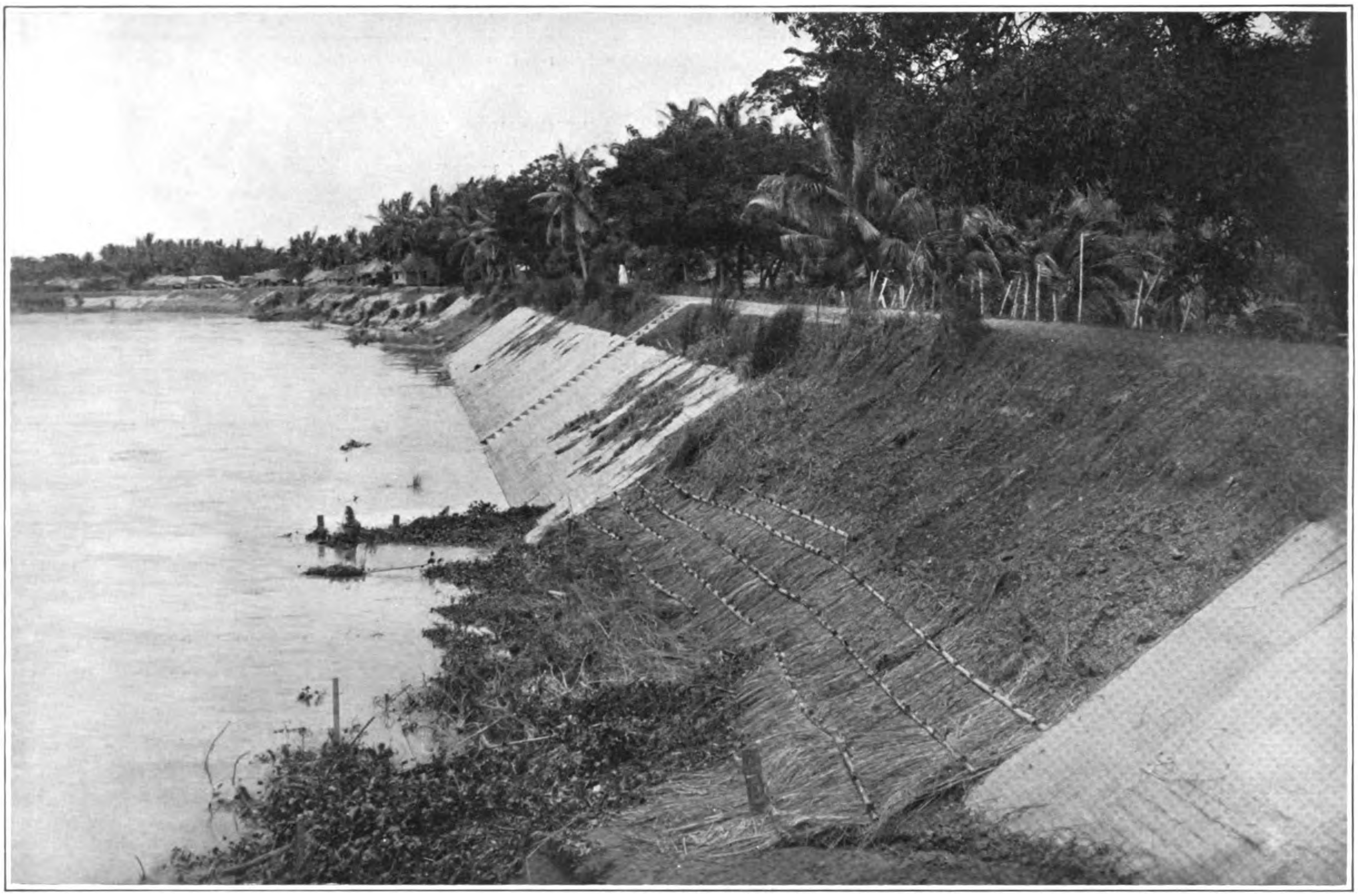
MUNICIPAL BUILDING, TABACO, ALBAY PROVINCE

TABLE VIII.—SCHOOL BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Albay	Bacacay	Additional rooms	Concrete and wood with G. I. roof (Standard Plan No. 10–A).	12.25×14.10× 7.65	2,651.0	₱16,606.11
Do.	Masarawag, Guinobatan	1	.....do	12.20×28.20× 7.75	2,468.0	11,771.13
Do.	Tagas, Daraga	1	Concrete and wood with G. I. roof (semipermanent.	7.20×11.20× 7.75	579.0	3,600.00
Do.	Guinobatan	Domestic Science	Concrete and wood with G. I. roof (Plan No. 2).	11.20×17.20× 7.44	1,356.0	11,700.00
Antique	San Jose	Extension	Concrete and wood with G. I. roof (Plan No. 10–A).	49.00×11.70× 8.06	3,973.0	27,579.30
Do.	Bugason	.....do	Concrete and wood with G. I. roof (semipermanent).	28.00×11.00× 8.18	2,183.7	8,585.66
Do.	Bagac	1	Wood with G. I. roof	12.28× 7.75	2,722.4	10,058.36
Bataan	Moron	1	Concrete and wood with G. I. roof	12.00×28.00× 7.75	2,722.4	12,801.77
Do.	Puerto Rivas, Balanga	1	.....do	12.00×28.00× 7.75	2,722.4	10,016.10
Batanes	Basco	1	Rubble with G. I. roof	25.40× 8.40× 6.00	1,216.2	7,000.00
Batangas	Balayan	Domestic Science	Concrete and wood with G. I. roof (Standard B. E. Plan No. 3).	3.50× 1.00× 2.65 7.00×12.50× 6.35	525.3	5,328.62
Do.	Lipa	Barrio School	Concrete and wood with G. I. roof (Standard Plan 1, 2, 3, 4—rooms only).	25.20× 9.20× 7.55	1,611.3	9,957.35
Do.	Lian	1	Concrete and wood with G. I. roof (B. P. W. Plan No. 10).	21.20×12.20× 8.18	1,979.5	10,292.02
Do.	Malvar	Additional rooms	Concrete and wood with G. I. roof (Standard Plan No. 10—1 room only).	9.20× 9.20× 6.80	501.3	2,991.00
Do.	Taal	1	Concrete and wood with G. I. roof (Standard Plan No. 10–A—4 rooms only).	28.20×12.20× 9.00 2–11.70× 7.20× 8.25	2,764.7	20,089.14
Do.	Nasugbu	1	Concrete and wood with G. I. roof (Standard Plan No. 10–A—3 rooms only).	12.20× 2.00× 9.00	1,889.8	14,434.77
Do.	Calaca	Extension	Concrete and wood with G. I. roof (Standard Plan No. 10–A—2 rooms).	14.20×12.00× 8.25	1,248.1	9,818.38
Do.	Ibaan	Annex	Concrete and wood with G. I. roof (Standard Plan No. 10–A—1 central room).	9.20× 9.20× 8.35	641.6	3,025.16
Do.	Palahunan, Bolbok	1	Concrete and wood with G. I. roof (Standard Plan No. 1, 2, 3, 4—2 central rooms).	18.20× 9.20× 8.00	1,188.3	6,515.87
Do.	Conde, Batangas	1	Concrete and wood with G. I. roof (Standard Plan No. 1, 2, 3, 4—1 central room).	9.20× 9.20× 8.00	594.2	3,997.39
Bohol	G. Hernandez	1	Concrete with G. I. roof (B. P. W. Standard Plan No. 10–A).	14.00× 12.00× 8.30	1,276.8	9,681.70
Do.	Tagbilaran	1	.....do	17.60×11.70× 7.61	1,423.2	10,505.15
Do.	Calape	1	.....do	11.72×14.00× 7.60	2,237.6	17,867.54
Do.	Antequera	1	Concrete and wood with G. I. roof (semipermanent).	11.00×11.00× 8.33	840.1	4,889.15
Do.	Lilia	1	.....do	14.00×12.00× 8.50	1,218.0	5,897.80
Do.	Talibon	1	.....do	11.00×17.50× 8.33	1,369.2	7,353.31
Bulacan	Polo, Obando	1	.....do	9.20×32.20× 7.00	2,386.8	5,089.20

TABLE VIII.—SCHOOL BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Bulacan	Calumpit	Extension	Concrete with G. I. roof (Pasig type)	14.20×11.93× 7.60	1,308.9	₱8,000.00
Do.	San Miguel	do.	Concrete with G. I. roof (Plan No. 7)	21.20×11.70× 7.85	2,140.2	10,600.34
Do.	Coloong, Polo	1	Concrete and wood with G. I. roof (semipermanent).	9.20×18.20× 7.00	1,182.8	7,000.00
Cagayan	Tuguegarao	1	Concrete and wood with G. I. roof (Standard Plan No. 10–A).	28.00×11.70× 5.20	2,335.8	15,321.04
Camarines Norte	Pandan, Daet	1	Concrete and wood with G. I. roof (Standard Plan No. 10–A—2 rooms).	32.20× 9.20× 8.16	2,001.7	4,999.74
Do.	Mercedes, Daet	1	do.	9.20× 9.20× 8.16	1,000.8	2,495.46
Do.	Talisay	1	do.	32.20× 9.20× 8.16	2,001.7	5,050.17
Do.	Calasgasan, Daet	1	do.	9.20× 9.20× 7.80	575.5	2,889.15
Do.	San Vicente	1	do.	9.20×18.20× 7.80	1,151.0	5,062.08
Do.	Labo	Domestic Science	do.	7.00×12.50× 5.35	488.7	3,754.70
Camarines Sur	Tigaon	Additional rooms	Concrete with G. I. roof.	16.10×21.45× 8.35	1,953.0	12,676.86
Do.	Caramoan	1	Concrete with G. I. roof (P. B. W. Plan Set 1624)	28.50×12.25× 8.40	2,572.9	19,394.64
Do.	Nabua	Additional rooms	Concrete with G. I. roof (B. P. W. Plan Set 1504).	11.30×17.80× 8.70	1,711.4	8,752.83
Do.	Naga	do.	Concrete and wood with G. I. roof (B. P. W. Plan Set 1504).	11.30×24.80× 9.00	2,311.2	10,315.35
Do.	Quipayo, Calabanga	1	Concrete and wood with G. I. roof (semipermanent).	9.30×14.30× 8.25	1,003.1	3,248.60
Do.	San Jose	1	Concrete with G. I. roof (B. P. W. Plan Set 1624).	17.60×25.80× 8.70	2,703.1	20,627.25
Capiz	Malinao	1	Concrete and wood with G. I. roof.	12.20×21.80× 7.95	2,075.4	10,353.48
Do.	Numancia	1	do.	12.20×21.20× 7.95	2,075.4	8,759.20
Do.	Tangalan, Makato	1	do.	12.20×14.20× 7.95	1,402.3	6,773.31
Do.	Pontevedra	1	do.	12.20×14.10× 7.95	1,380.9	8,284.26
Do.	Sigma	1	do.	12.20×24.70× 7.95	4,260.6	15,304.96
Do.	Banga	1	do.	12.20×28.20× 7.95	2,752.5	6,375.59
Cebu	Malabayoc	1	do.	12.00×21.00× 8.60	1,950.4	18,457.75
Do.	Sogod	1	do.	11.00×10.50× 8.60	868.5	6,288.64
Do.	Naga	Domestic Science	Concrete and wood with G. I. roof (B. E. Plan No. 3).	7.00×12.50× 7.30	586.8	5,989.54
Do.	Ronda	1	Concrete with G. I. roof (B. E. Standard Plan No. 10).	21.00×12.00× 8.40	1,871.1	12,000.00
Do.	Liloan	1	do.	22.00×12.00× 8.40	2,494.9	14,761.08
Do.	Talamban	1	Concrete and wood with G. I. roof.	12.00×21.00× 8.60	1,931.6	9,592.00
Do.	Badian	1	Concrete with G. I. roof.	9.00×12.20× 7.91	820.2	10,818.12
Do.	Ronda	1	Concrete with G. I. roof (Standard Plan No. 10–A).	21.00×12.00× 8.40	1,948.4	12,000.00
Do.	Danao	1	Stone and Adobe with G. I. roof.	10.95×33.85× 3.88	1,426.6	4,256.86
Do.	Lawayan, Dalaguete	1	Concrete and wood with G. I. roof.	9.00×18.00× 8.10	1,189.9	6,504.16
Do.	Simala, Sibonga	1	do.	9.00× 9.00× 8.10	606.2	3,050.00
Do.	Canbanua, Argao	1	do.	9.00× 9.00× 8.10	606.2	7,099.69
Do.	Taloal, Argao	1	do.	9.00× 9.00× 8.10	606.2	3,000.00
Do.	Alcoy	1	do.	11.10×10.50× 8.60	868.5	11,954.29
Do.	San Francisco	Domestic Science	do.	7.00×12.50× 7.30	586.8	6,000.00
Do.	Gairan, Bogo	1	do.	9.00× 9.00× 8.10	606.2	3,000.00
Do.	Binabag, Bogo	1	do.	9.00×18.00× 8.10	1,181.1	5,000.00
Do.	Bogo	1	do.	12.00×21.00× 8.60	1,948.4	7,984.25
Do.	San Remigio	1	do.	11.00×17.50× 8.60	1,481.7	9,577.50
Do.	Tabogon	1	do.	12.00×21.00× 8.60	1,948.4	9,999.72
Do.	Santa Fe	1	do.	12.00×14.00× 8.60	1,176.7	7,948.49
Cotabato	Glan	1	do.	12.00×14.00	1,104.6	5,600.00
Davao	Talomo, Davao	1	do.	7.00×12.00× 6.00	595.5	3,400.21
Do.	Malita	1	Concrete and wood with G. I. roof (Standard Plan No. 10).	28.00×12.00× 6.00	2,382.3	11,845.00
Do.	Hijo, Tagum	1	Concrete and wood with G. I. roof (Standard Plan No. 1).	9.00× 9.00× 6.00	602.5	2,715.90
Do.	Bago	1	Concrete and wood with G. I. roof (Standard Plan No. 1).	9.00× 9.00× 6.00	602.5	2,759.00
Do.	Sigaboy	1	Concrete and wood with G. I. roof (Standard Plan No. 1).	9.00× 9.00× 6.00	602.5	2,736.40
Do.	Davao	Additional rooms	Concrete with G. I. roof (Standard Plan No. 10)	9.20× 7.20× 6.00	1,448.1	10,748.00
Ilocos Norte	Sarrat	1	Concrete and wood with G. I. roof.	9.00×33.00× 5.35	1,468.8	12,847.72
Do.	Laoag	Extension	Concrete and wood with G. I. roof (2-story)	18.00× 9.00× 8.40	2,050.7	17,403.95
Do.	Apaya, Laoag	1	do.	9.00×32.00× 5.00	990.3	1,999.44
Do.	Bacarra	Addition	Concrete with G. I. roof.	7.00× 9.00× 5.25	1,858.0	8,200.16
Do.	Paoay	1	do.	28,00×12.00× 5.50	2,277.6	17,736.64
Do.	Pasuquin	1	Masonry and brick	7.50×24.00× 2.95	1,487.0	9,070.88
Ilocos Sur	Candon	1	Concrete with G. I. roof.	21.40×12.25× 7.60 14.40× 9.20× 7.60	2,673.0	20,516.62
Do.	Santa Maria	1	do.	14.60×12.25× 8.60	1,282.0	9,761.74
Do.	Cabugao	1	Rubble and concrete (semipermanent)	16.14×10.53× 8.20	1,220.0	5,354.60
Do.	Narvacan	1	Concrete with G. I. roof (Standard Plan No. 20)	51.30×51.40×11.30	11,918.2	89,220.92
Do.	Santo Domingo	1	Concrete and wood with G. I. roof (semipermanent).	14.15×12.15× 7.95	1,308.1	6,449.40
Do.	Vigan	High School	Concrete with G. I. roof (Pasig type)	51.40×44.30×11.60	13,470.4	104,286.41
Do.	Sabuanan, Santa Lucia	1	Concrete and wood with G. I. roof (semipermanent).	25.15× 9.15× 8.23	1,768.7	10,056.87
Do.	Cabugao	1	Rubble and brick with G. I. roof (semipermanent).	16.14×10.53× 8.20	1,220.2	5.381.45
Do.	Bantay	1	Rubble and brick with G. I. roof (2-story reconstruction)	28.25×17.61× 8.34	2,954.8	9,947.70
Iloilo	San Miguel	1	Concrete with G. I. roof (Standard Plan No. 10–A).	12.00×28.00× 8.21	2,472.9	14,835.08
Do.	Ajuy	1	Concrete with G. I. roof (Standard Plan No. 7)	14.20×39.20× 7.40	3,459.0	18,732.26
Do.	Lucena	1	Concrete with G. I. roof (Standard Plan No. 10–A).	12.00×14.00× 8.81 11.70×17.60× 8.56	3,242.8	18,802.45
Do.	La Paz	Vocational	Concrete with G. I. roof (Standard Plan No. 7)	14.20×39.20× 7.40	3,459.0	27,048.22
Do.	Cabatuan	Domestic Science	Concrete and wood with G. I. roof.	7.00×12.50× 6.35	525.3	4,844.47
Isabela	Santiago	1	Concrete and wood with G. I. roof (Standard Plan No. 10).	12.00×21.00× 8.50	1,815.0	14,164.65
Do.	Ilagan	Shop Building	do	6.20× 8.20× 5.37	1,056.9	6,272.11
Do.	Gamu	1	do.	12.00×28.00× 8.50	2,536.0	17,115.36
Do.	Reina Mercedes	1	Concrete and wood with G. I. roof (B. E. Standard Plan No. 10).	14.00×12.00× 8.50	1,210.0	6,395.25
Laguna	Cavinti	1	Concrete and wood with G. I. roof (Standard Plan No. 10).	8.10×13.50×30.40	2,680.6	10,728.12
Do.	Pañgil	1	Concrete with G. I. roof	8.10×13.50×15.40	1,340.3	16,844.60
Do.	Santa Rosa	1	do.	10.95×20.20×38.10	4,126.8	44,953.83
Do.	Cabuyao	Additional rooms	do. (2-story)	8.10× 9.20×28.40	2,003.3	11,388.67



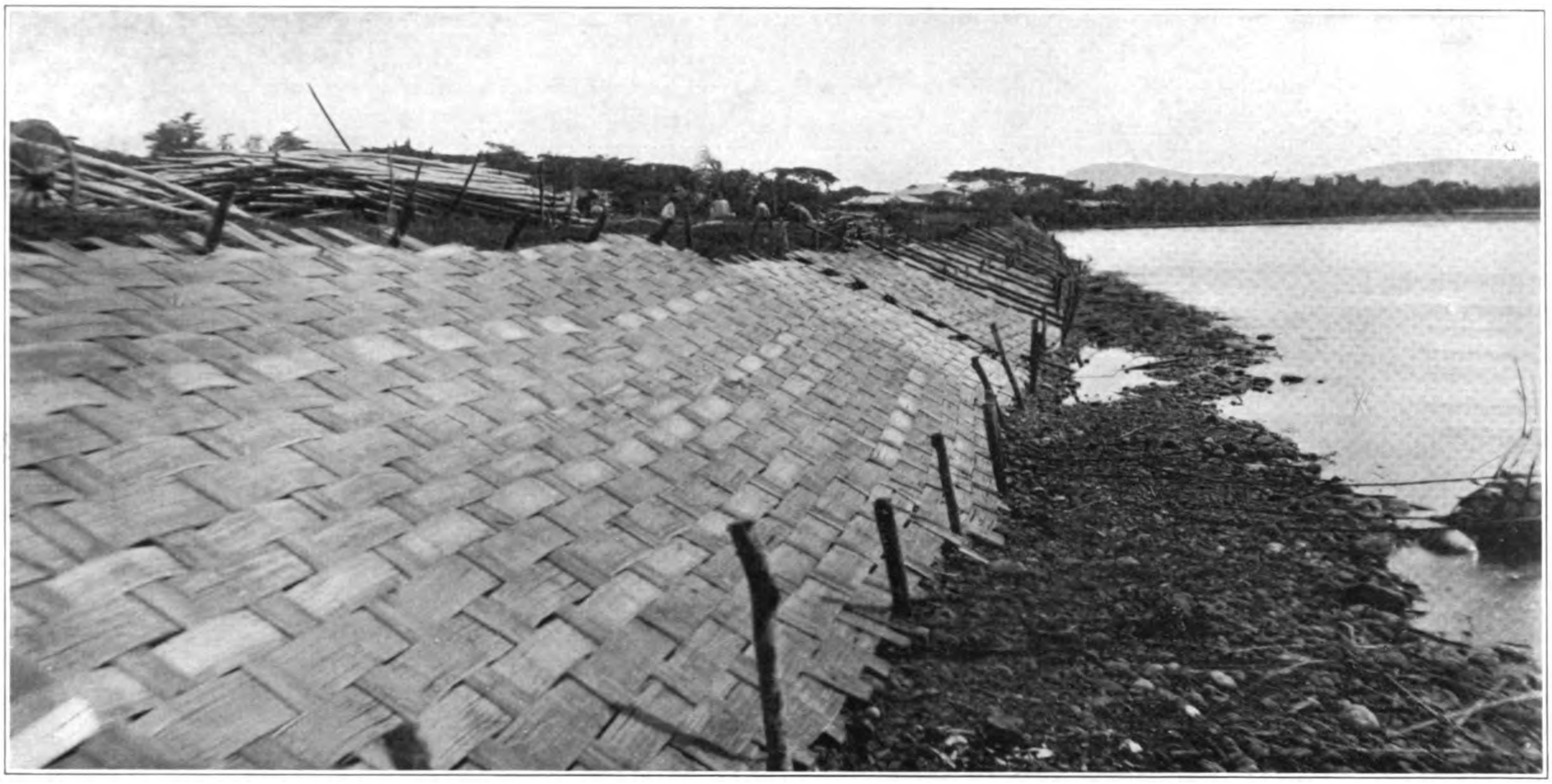
BAYAMBANG RIVER BANK REVETMENT, PANGASINAN PROVINCE

TABLE VIII.—SCHOOL BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Lanao	Lumbatan	Academic	Concrete and wood with G. I. roof	32.00× 9.00× 5.00	1,661.9	₱11,515.70
La Union	Caba	Additional rooms	Concrete with G. I. roof (Standard Plan No. 10–A).	24.90×11.70× 8.35	2,150.0	8,147.36
Do.	Balaoan	do.	Concrete with G. I. roof (Standard Plan No. 10–A).	28.25×12.25× 9.00	3,416.1	13,964.49
Do.	Bacnotan	do.	Concrete with G. I. roof (Standard Plan No. 10–A).	9.20×21.10× 8.06	1,336.4	12,345.35
Do.	San Fernando	1	Concrete with G. I. roof (Standard Plan No. 20)	28.30×11.80× 9.35	2,591.3	17,977.94
Do.	Lingsat, San Fernando	1	Concrete and wood with G. I. roof (semipermanent).	18.15× 9.15× 7.75	1,116.2	4,947.06
Do.	Rosario	1	do.	21.15×12.15× 7.05	1,541.8	5,098.35
Leyte	Bugho	1	do.	9.00×32.00× 7.00	1,707.0	11,498.80
Do.	Burauen	1	Concrete with G. I. roof	15.60×51.40× 7.46	3,718.1	31,997.00
Do.	Dulag	1	do.	17.60×39.00× 7.46	3,440.9	25,592.00
Do.	Kiling, Tanauan	1	do.	2.00× 9.20× 7.10× 7.20	811.8	8,884.00
Do.	Tacloban	High School	Concrete with G. I. roof (Pasig type)	2–43.42×11.69× 7.20	9,818.0	127,000.00
Do.	Dulag	1	Concrete with G. I. roof (Standard Plan No. 10–A).	17.60×11.70× 7.46	2,124.8	21,429.00
Do.	Barugo	1	Concrete with G. I. roof (B. E. Standard Plan No. 7).	5.00× 7.10× 9.20	2,079.0	21,403.00
Do.	Naval	Additional rooms	do.	2.00× 7.10×12.20	1,128.0	9,951.00
Do.	Caniuan, Maasin	1	Concrete and wood with G. I. roof (semipermanent).	9.00×32.00× 7.00	1,707.0	12,000.00
Do.	Ormoc	Extension	Concrete and wood with G. I. roof (2-story, semipermanent).	7.00×11.10×11.50	837.2	12,206.21
Masbate	Masbate	Domestic Science	do.	12.50× 7.00× 4.80	488.2	4,500.00
Do.	Mobo, Masbate	1	do.	18.00× 9.00× 5.00	955.8	5,000.00
Do.	Uson, Dimasalang	1	do.	21.00×12.00× 5.40	1,656.9	8,957.47
Mindoro	Lubang	1	do.	12.00×11.00× 7.76	1,012.6	10,933.38
Do.	Looc, Lubang	1	do.	14.00× 9.00× 7.23	770.5	8,100.94
Do.	Calapan	1	do.	28.50×12.50× 5.70	2,688.0	19,511.92
Misamis	Balingasag	1	Concrete with G. I. roof	28.00×12.00× 5.20	2,158.8	18,000.00
Do.	Sagay	1	do.	11.70×10.60× 5.20	781.0	9,000.00
Do.	Tagoloan	1	Concrete and wood with G. I. roof (semipermanent).	28.00×12.00	2,158.8	9,829.82

TABLE VIII.—SCHOOL BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Nueva Ecija	Talavera	Domestic Science	Wood with G. I. roof	12.00×17.00× 5.75	409.5	₱5,587.78
Do.	Santa Rosa	1	Concrete, sawali and wood with G. I. roof	39.20×40.40× 5.25	3,640.0	16,973.30
Nueva Vizcaya	Bayombong	Domestic Science	Concrete and wood with G. I. roof	7.00×12.50× 4.00	503.1	6,085.15
Do.	do.	Academic	do.	9.00×32.00× 5.00	1,733.7	13,463.10
Do.	do.	Additional rooms	do.	50.00×24.50× 5.40	5,875.3	9,908.50
Do.	Bagabag	1	do.	9.00×32.00× 5.00	1,733.7	6,994.01
Do.	Bayombong	High School	do.	50.00×24.50× 5.40	5,875.3	14,881.45
Occidental Negros	Bago	1	Concrete with G. I. roof	10.50×32.45× 9.00	2,579.0	24,999.82
Do.	Sarabia	Extension	Wood with G. I. roof	18.00× 9.00× 7.91	1,022.7	4,196.60
Do.	Soledad, Isabela	1	Concrete and wood with G. I. roof	21.00×12.00× 7.75	1,656.9	8,783.12
Do.	Himamaylan	Domestic Science	Concrete and wood with G. I. roof (Pulupandan type).	11.00× 8.00× 6.50	484.8	2,861.52
Do.	Sagay	Extension	do.	18.00× 9.20× 7.41	1,032.5	6,596.65
Do.	Calatrava	Domestic Science	Concrete and wood with G. I. roof (Pulupandan type).	11.00× 8.00× 6.50	484.8	3,999.74
Do.	Isabela	Extension	do.	24.90×11.70× 8.25	1,974.9	16,252.03
Oriental Negros	Siquijor	1	Wood with G. I. roof	28.00×12.00× 5.40	2,479.7	12,500.00
Do.	Ayungon	1	Concrete and wood with G. I. roof (semipermanent).	28.00×12.00× 5.40	2,613.6	13,400.00
Do.	Maria	1	do.	28.00×12.00× 5.40	2,613.6	13,400.00
Do.	Payabon, Manjuyod	1	do.	21.00×12.00× 5.40	1,968.1	10,500.00
Do.	Bacong	Additional rooms	do.	24.50×11.00× 5.40	2,110.3	10,827.69
Do.	Zamboanguita	do.	do.	17.50×11.00× 5.40	1,533.9	8,594.42
Palawan	Aborlon	Agricultural School	Concrete and wood with G. I. roof (B. E. Standard Plan).	18.55× 9.55× 8.02	1,420.7	6,338.15
Pampanga	Apalit	Additional rooms	Concrete with G. I. roof (Standard Plan No. 10–A).	14.00×12.25× 8.66 11.70×17.60× 8.66	2,761.1	20,507.35
Do.	Bacolor	do.	do.	14.00×12.25× 8.37 11.70×24.60× 8.37	3,314.8	23,511.54
Do.	Lubao	1	do.	14.00×12.25× 8.59 11.70×24.60× 8.59	4,218.5	15,013.12
Do.	Sexmoan	1	Concrete and wood with G. I. roof (semipermanent).	9.00×18.00× 8.90	1,260.0	4,957.20
Do.	Floridablanca	1	Concrete with G. I. roof (Standard Plan No. 10–A).	17.60×11.70× 9.40	2,374.6	14,416.12
Do.	Guagua	Additional rooms	do.	21.60×11.60× 8.00	3,930.00	25,610.54
Pangasinan	Rosales	1	Concrete with G. I. roof (Standard Plan No. 10–A) 7 class rooms, library, storeroom and an office.	12.25×28.50× 8.06 11.70×28.50× 8.06	4,784.7	31,676.50
Do.	Binmaley	1	Bricks with G. I. roof (reconstruction)	11.30×49.24× 9.00	4,480.8	13,921.21
Do.	Mangaldan	1	Concrete with G. I. roof (Standard Plan No. 10–A).	12.25×21.00× 8.06	1,946.0	12,383.73
Do.	Nalsian, Bayambang	1	Concrete and wood with G. I. roof (semipermanent.)	9.00×18.00× 7.70	1,151.4	5,153.69
Do.	Angio, San Fabian	1	Concrete and wood with G. I. roof (reconstruction).	32.40×21.00× 8.60	1,185.5	4,077.97
Do.	Alos, Alaminos					
Do.	Bued, Calasiao	1	do.	24.08× 9.63× 7.70	1,701.6	5,996.81
Do.	Villanueva, Bautista	1	do.	14.00×11.00× 7.88	1,084.4	5,301.15
Do.	Dompay, San Carlos	1	Concrete and wood with G. I. roof (semipermanent).	18.00× 9.00× 7.70	1,151.4	4,462.03
Do.	Dagupan	Additional rooms	do.	18.00× 9.00× 7.70	1,151.4	6,987.59
Do.	Urdaneta	do.	Concrete with G. I. roof (Standard Plan No. 10–A).	21.30×11.70× 8.46	3,605.1	19,461.54
Do.	Rosales	do.	do.	21.30×11.70× 8.06	1,802.6	11,114.91
Do.	Doyong, San Carlos	1	do.	21.30×11.70× 8.06	1,211.3	11,663.90
Rizal	Pateros	Extension	Concrete with G. I. roof (B. E. Standard Plan 2)	14.20× 9.20× 8.05	1,018.4	7,370.02
Do.	do.	do.	Concrete with G. I. roof (Standard Plan No. 5)	9.20×12.10× 7.90	879.4	5,223.65
Do.	Binangonan	do.	Concrete and wood with G. I. roof (semipermanent).	7.10×12.10×10.85	932.5	3,450.00
Do.	Pasig	do.	do.	24.50×11.00× 8.50	1,975.4	7,900.00
Do.	Marikina	do.	Concrete with G. I. roof (Standard Plan No. 10–A).	24.90×11.70× 8.80	2,083.0	13,950.00
Do.	Novaliches, Caloocan	1	Concrete and wood with G. I. roof (semipermanent).	2–7.00× 9.00× 8.05	863.1	4,450.00
Romblon	Magallanes, Cajidiocan	1	do.	25.00× 9.00× 8.05	1,541.2	6,800.00
Do.	Azagra, San Fernando	1	Concrete and wood with G. I. roof (B. E. Standard Plan No. 4–A).	36.00× 9.00	2,324.5	7,411.34
Do.	Looc	1	do.	9.00× 9.00	581.1	3,101.42
Samar	Catbalogan	Trade School	Concrete and wood with G. I. roof (B. E. Standard Plan No. 10).	28.00×12.00	2,698.8	10,192.71
Do.	Allen	1	Concrete with G. I. roof (B. E. Standard Plan No. 8).	41.10×12.40× 7.00	3,045.6	14,072.05
Do.	Calbiga	1	Concrete with G. I. roof (B. E. Standard Plan No. 7).	39.20×14.20× 7.40	3,540.0	33,482.78
Sorsogon	Castilla	1	Concrete and wood with G. I. roof (B. E. Standard Plan No. 4).	36.00×10.50× 4.50	2,401.3	4,612.24
Surigao	Claver, Gigaquit	1	Concrete with G. I. roof (3 rooms of Plan No. 10–A).	21.50×12.00× 8.40	1,831.8	13,665.10
Do.	Placer	1	Wood with G. I. roof (2 rooms, semipermanent).	18.00× 9.00× 6.00	972.0	7,663.77
Do.	Lanuza	1	Wood with G. I. roof (4 rooms, semipermanent).	12.00×28.00	2,234.4	12,608.02
Tarlac	Camiling	1	Concrete and wood with G. I. roof (semipermanent).	18.00× 9.00× 6.00	974.0	7,748.34
Do.	Tarlac	Domestic Science	Concrete and wood with G. I. roof	15.60×51.40× 7.65	3,744.6	32,013.95
Do.	Victoria	Additional rooms	Concrete with G. I. roof (special plan)	23.20×14.20× 5.10	1,939.3	19,200.04
Tayabas	Lucban	1	Concrete and wood with G. I. roof	11.80× 7.00× 5.20	1,135.1	6,340.63
Do.	Baler	1	Concrete with G. I. roof (2 story building)	2–9.70×28.55× 9.50 39.00× 9.50× 9.50	10,622.8	78,356.94
Do.	Tayabas	1	Concrete and wood with G. I. roof (9 rooms)	2–21.20× 8.20× 4.90 20.00×11.50× 4.90	1,891.7	21,026.47
Do.	Catanauan	1	Concrete and wood with G. I. roof (2-story building).	2–18.40× 9.44× 9.50 22.00× 9.20× 9.50	5,764.1	60,028.28
Do.	Bondo, Mulanay	1	Concrete and wood with G. I. roof	21.00× 7.80× 4.50	900.9	4,884.29
Do.	Atimonan	Trade School	Concrete and wood with G. I. roof (B. E. Standard Plan No. 10).	12.00× 7.00× 5.00	504.0	4,055.28
Do.	Gumaca	Additional rooms	Concrete and wood with G. I. roof (B. E. Standard Plan No. 8).	41.10×10.20× 5.00	2,159.7	19,884.59
Do.	Atimonan	Domestic Science	Concrete with G. I. roof (B. E. Standard Plan No. 5).	45.00× 9.00× 5.00	4,482.3	35,557.33
Do.	Lopez	Additional rooms	Concrete and wood with G. I. roof	17.00×13.50× 5.95	1,772.9	11,999.36
Do.	Calumpang, Tayabas	Additional rooms	Concrete and wood with G. I. roof (B. E. Standard Plan No. 15).	11.50× 7.00× 5.00	487.9	4,343.20
			Concrete and wood with G. I. roof (B. E. Standard Plan No. 3).	2–7.00× 9.00× 5.00	772.8	9,940.53



TEMPORARY BANK REVETMENT, MAGAT RIVER CONTROL, BAYOMBONG, NUEVA ECIJA

TABLE IX.—HOSPITALS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Agusan	Talacogon	Dispensary	Concrete and wood with G. I. roof	9.50× 5.50	352.6	₱2,460.20
Bukidnon	Malaybalay	Emergency Hospital	Concrete and wood with G. I. roof (B. P. W. Set 2238).	19.00×15.00	1,132.9	23,500.00
Capiz	Kalibo	1	Concrete with G. I. roof	26.00×26.00× 9.00 11.00×17.00× 9.00	6,083.9 125.0	73,604.42
Ilocos Sur	Cervantes	Kitchen	Concrete and wood with G. I. roof	8.53× 4.15× 4.70		1,999.42
La Union	Bacnotan	Dispensary	do	5.50× 9.50× 7.00	192.9	2,553.87
Manila	Taft Avenue	do	Concrete with G. I. roof (2-story)	87.35×18.65× 9.73	7,584.5	49,330.29
Do.	San Felipe Neri, Rizal	Doctors' Quarters 3 Type "B."	Concrete, wood, and tiles with G. I. roof	12.00× 9.00× 9.60	850.0	38,553.73
Do.	do	Psychopathic Hospital 1 Type "A."	do	9.00×13.50× 9.60	727.7	
Do.	do	Garage and Servants' Quarters, Psychopathic Hospital.	Concrete and tiles with G. I. roof	28.20×16.40× 6.20	1,891.5	10,496.74
Misamis	Balingasag	Dispensary	Concrete and wood with G. I. roof	6.20× 8.20	248.9	3,500.00
Occidental Negros	Calatrava	Emergency Stage No. 2	do	9.50×11.50× 6.30	370.5	3,305.07
Do.	Bacolod	Stage No. 4	Concrete with G. I. roof	9.50×29.10× 6.30	973.9	21,517.83
Do.	do	Isolation Ward	Concrete and wood with G. I. roof	11.00×11.50× 9.20	997.3	9,584.12
Do.	Hinigaran	Emergency Hospital	do	11.50× 9.50× 6.30	370.5	3,948.88
Tarlac	Tarlac	Nurses' Home	Wood with G. I. roof	12.00×19.50× 4.90	901.2	8,000.00
Lanao	Dansalan	Leper Cottage, Male Ward.	Concrete, sawali and wood with nipa roof	9.00× 5.00× 4.50	203.8	1,579.23
Do.	do	Leper Cottage, Female Ward.	do	9.00× 5.00× 4.50	203.8	

TABLE X.—MARKET BUILDINGS AND TIENDAS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Albay	Camalig	2 Tiendas	Concrete with G. I. roof	2–6.20×12.70× 4.95	719.3	₱8,897.21
Batangas	Taal	Market	Concrete with G. I. roof (Type "A")	2–21.00×43.50	5,204.0	43,274.03
Bohol	Loay	Block of Tiendas	do	4.40×44.70× 4.15	891.6	32,280.10
Bulacan	Paombong	Market	do	23.00×15.00× 6.37	1,024.7	4,250.00
Camarines Sur	Iriga	Market Tiendas	do	6.20×40.40× 5.35	1,173.0	13,125.25
Do.	Tigaon	do	do	5.40×28.35× 5.08	696.1	8,485.33
Do.	Goa	Market Matadero Midden shed with septic vault.	do	21.00×36.10× 9.12 8.90×12.20× 5.47 5.40× 8.70× 5.65 1.80× 6.60× 2.36	6,483.5	30,984.76
Capiz	Dumalag	Market	do	15.00×43.00× 7.50	2,965.2	15,391.75
Do.	Banga	do	do	21.00×36.10× 8.75	4,011.0	17,568.96
Cavite	Mendez	do	Concrete with G. I. roof (Standard type)	18.00×31.00× 5.95	2,358.9	15,028.00
Cebu	Consolacion	do	do	18.00×34.00× 8.15	3,555.9	14,995.09
Cotabato	Salimbao	do	do	15.00×47.00× 3.50	2,467.5	5,106.86
Do.	Tamontaca	do	do	12.00×36.50× 3.00	1,314.0	2,625.73

TABLE X.—MARKET BUILDINGS AND TIENDAS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Ilocos Norte	Laoag	Block of Tiendas	Concrete with G. I. roof (Standard type)	6.20×17.40× 4.35	646.0	₱7,355.95
Do.	Dingras	do.	do.	2-5.40×20.70× 3.40	1,463.4	17,195.43
Iloilo	Miagao	Market	Concrete with G. I. roof (Type "A")	21.00×43.50× 8.50	5,361.0	25,054.09
Do.	Oton	do.	do.	21.00×50.90× 8.70	5,571.8	25,901.43
Do.	Dueñas	do.	Concrete with G. I. roof (Standard market)	12.00×30.00× 7.08	2,646.0	9,864.10
Do.	Banate	do.	do.	12.00×25.50× 7.08	7,673.0	7,853.88
Do.	Balasan	do.	do.	12.00×30.00× 7.08	2,646.0	12,390.85
Do.	Janiuay	do.	do.	15.00×39.00× 7.38	2,781.2	15,921.51
La Union	Agoo	Market	Concrete with G. I. roof	8.30×25.80× 5.50	981.2	5,851.21
Do.	San Juan	do.	do.	18.00×22.00× 8.50	2,442.0	9,789.02
Masbate	Aroroy	do.	do.	9.00×18.00× 3.15	625.7	3,414.50
Nueva Ecija	San Jose	Slaughterhouse	do.	12.00× 8.90× 4.75	421.9	4,050.50
Do.	Gapan	Market	do.	15.00×35.00× 5.33	2,227.1	11,881.10
Do.	Guimba	do.	do.	18.00×38.00× 5.85	3,078.0	16,921.73
Do.	Santa Rosa	do.	Concrete with G. I. roof (Standard Plan No. 658).	15.00×27.00× 5.33	1,718.0	8,673.95
Do.	Gapan	Tiendas	Concrete with G. I. roof (Standard Plan No. 2303).	15.00×35.00× 5.33	2,227.1	10,751.99
Occidental Negros	Victorias	Market	Concrete with G. I. roof (Type "A")	21.00×36.10× 6.92	3,283.2	24,045.07
Oriental Negros	Lazi	do.	do.	22.50× 9.00× 4.00	1,592.8	7,416.02
Do.	Bacong	do.	Concrete with G. I. roof (Solano type)	22.50× 9.00× 4.00	1,310.9	5,302.50
Do.	Bais	Tiendas	do.	28.00× 3.00× 2.50	315.4	4,000.00
Do.	do.	do.	do.	28.00× 3.00× 2.50	315.4	
Pampanga	Guagua	do.	do.	12.50× 7.50× 5.50	453.8	22,712.54
Do.	do.	do.	do.	41.00× 7.50× 6.30	1,606.1	
Do.	do.	do.	do.	45.00× 7.50× 6.30	1,802.3	
Pangasinan	Urdaneta	do.	Concrete with G. I. roof (Standard tiendas)	G-6.00×24.70× 5.42 H-6.00×24.80× 5.42	2,328.7	19,140.66
Do.	Alaminos	Market	Concrete with G. I. roof (Type "A")	25.10×21.00× 8.92	2,544.8	12,015.85
Do.	San Nicolas	do.	do.	32.40×21.00× 8.60	4,144.6	14,061.55
Do.	Alaminos	Additional	do.	25.80×21.00× 8.92	2,642.5	12,916.54
Rizal	Marikina	Market	do.	32.40×21.00× 8.50	5,788.4	11,000.00
Sorsogon	Casiguran	do.	Concrete with G. I. roof (Type "B")	36.10×21.00× 7.12	6,325.7	17,585.10
Do.	Bulan	do.	do.	30.00×12.00× 5.85	1,836.0	7,506.90

TABLE XI.—PRESIDENCIA BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Albay	Tabaco	1	Concrete with G. I. roof (2-story) (Davao Type).	12.40×24.80×13.20	3,974.0	₱43,550.34
Bataan	Samal	1	Concrete, adobe, stone, and wood with G. I. roof (2-story).	14.00×10.00× 9.94	818.2	5,282.87
Batangas	Bolbok	1	Concrete with G. I. roof (2-story)	25.50×12.00×13.65	3,841.6	52,299.56
Benguet	Bukod	1	Concrete and wood with G. I. roof (2-story)	8.00×13.00	104.0	1,300.00
Bulacan	Bustos	1	Concrete with G. I. roof (Clarin Type)	2.10×12.10× 3.80 5.80× 1.85× 3.80	434.7	3,297.57
Cagayan	Abulog	1	Concrete and wood with G. I. roof (2-story)	12.00× 7.00× 7.50	951.9	11,890.29
Camarines Sur	Tigaon	1	Concrete with G. I. roof (2-story)	10.40×20.10×11.55	1,856.9	18,688.73
Do.	Bula	1	do.	8.20×13.20×11.05	964.5	13,437.96
Do.	Sañgay	1	Concrete, stone, and wood with G. I. roof (2-story), Special Type.	7.70×18.20× 9.85	1,042.5	11,954.51
Capiz	Mambusao	1	Concrete and wood with G. I. roof (2-story)	7.15×12.10×10.20	979.0	8,546.17
Ilocos Norte	Pinili	Addition	Concrete and wood with G. I. roof (2-story), Clarin Type.	2-3.50× 7.40× 3.80 2-4.00× 8.40× 3.50	518.0	5,442.99
Do.	Bangui	1	Concrete and wood with G. I. roof (2-story), (Compostela Type).	13.00× 8.00× 3.90 14.00× 9.00× 3.50	1,200.3	17,781.39
Marinduque	Boac	1	Concrete with G. I. roof (2-story)	18.30× 8.60× 4.60	1,444.0	23,978.87
Do.	Buenavista	1	Concrete and wood with G. I. roof	14.00× 7.00× 4.00	416.0	6,777.54
Masbate	Milagros	1	Adobe and wood with G. I. roof (2-story)	9.30×14.00× 7.70	1,341.6	7,150.00
Nueva Vizcaya	Solano	1	Concrete and wood with G. I. roof (2-story)	6.80×11.80× 3.80	767.4	17,797.97
Occidental Negros	Talisay	1	Concrete and wood with G. I. roof (2-story)	15.05×20.00×10.90	1,921.3	32,203.51
Pangasinan	Bugallon	1	Concrete and wood with G. I. roof (2-story)	1st-3.80×11.80× 6.00 2nd-3.50×13.20× 8.20	1,036.3	11,437.10
Do.	Umingan	1	Concrete and tiles with G. I. roof (2-story), (Gumaca Type).	1st-18.30× 8.60× 5.25 2nd-10.30×20.00× 6.30	1,909.7	24,547.03
Sulu	Jolo	1	Concrete and wood with G. I. roof (2-story)	11.90×12.90	1,646.7	6,693.36
Do.	Siet Lake	1	do.	9.25× 8.25	898.0	3,945.23
Tayabas	Baler	1	Concrete and wood with G. I. roof (2-story) (Candelaria Type).	14.30× 8.60× 8.35	1,292.7	11,685.85

TABLE XII.—MISCELLANEOUS BUILDINGS

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Abra	Lagangilang	Teachers' Cottage	Concrete and wood with G. I. roof	13.50× 9.65× 6.90	788.5	₱6,730.19
Agusan	Butuan	Provincial Treasurer's Bodega.	Concrete with G. I. roof	5.00× 6.00	139.6	879.92
Albay	Legaspi	2 Toilets for Normal School.	Concrete with G. I. roof	2-6.30×12.30× 4.75	712.9	12,539.00
Do.	Guinobatan	Students' Cottage	Concrete and wood with G. I. roof	5.00× 7.98× 5.35	173.0	3,300.00
Do.	do.	do.	do.	5.00× 7.00× 5.35	173.0	
Do.	Legaspi	Mess Hall	Concrete with G. I. roof (P. H. S. Mess Hall)	10.15×19.15× 6.30	1,369.0	9,548.00
Do.	do.	Barracks	Concrete and wood with G. I. roof	7.65×15.15× 6.50	781.0	20,917.00
Do.	do.	do.	do.	7.65×15.15× 6.50	781.0	
Do.	do.	Treatment Center	do.	8.15×12.15× 6.60	781.0	
Do.	do.	Kitchen	do.	6.15× 9.15× 5.60	345.0	
Batangas	Batangas	Provincial Capitol	Concrete with G. I. roof (2-story)	18.94×29.70 2-10.00×34.30 2-34.95×10.41 2-11.01×16.41	27,840.8	375,000.00
Benguet	Trinidad	Boys' Dormitory	Concrete and wood with G. I. roof (3-story)	13.00×35.00	4,652.0	19,600.36
Do.	Baguio	Teachers' Cottage	do.	8.00× 8.00	220.0	2,000.00
Bukidnon	Managok, Malaybalay	Principal's Cottage	do.	17.50×13.00	947.3	5,500.00
Do.	do.	Teachers' Cottage	do.	7.00×11.00	280.7	4,500.00
Camarines Norte	Daet	Extension Provincial Government Building for vault.	Concrete with G. I. roof (2-story)	4.30× 4.55× 8.13	189.0	2,970.89

ILOILO MARGINAL WHARF, UNDER CONSTRUCTION

TABLE XII.—MISCELLANEOUS BUILDINGS—Continued

Province	Municipality	Buildings	Type and materials used	Principal dimensions	Contents	Cost
				Meters	*Cubic meters*	
Camarines Sur	Pili	Teachers' Cottages, 2	Concrete and wood with G. I. roof (Standard Plan No. 5).	8.00×17.00× 7.35	1,499.4	
Do.	Pili	Students' Cottages, 5	Concrete and wood with G. I. roof (Standard Plan).	5.00× 7.00× 4.95	956.0	₱16,139.83
Do.	Baao	Garden House	Concrete and wood with G. I. roof (B. E. Standard Plan).	10.30× 6.30× 5.30	263.7	1,349.79
Cotabato	Cotabato	Provincial Building	Concrete with G. I. roof (2-story)	38.20×12.80× 8.10	5,127.6	53,000.00
Davao	Davao	Home-seekers' Home	Wood with G. I, roof	7.00×12.00× 5.10	368.8	1,008.89
Iloilo	Iloilo	Toilet for School	Concrete with G. I. roof (Special Plan)	4.00× 5.00× 5.70	113.8	1,500.00
Do.	Dingle	do.	do.	4.00× 5.00× 5.70	113.8	1,627.73
Do.	La Paz	Kitchen for Domestic Science.	Concrete and wood with G. I. roof	6.00× 8.00× 6.65	249.6	2,421.73
Laguna	San Pablo	Cemetery Chapel	do.	6.10×10.45× 8.30	446.5	10,086.50
Do.	Santa Cruz	Provincial Courthouse	Concrete and wood with G. I. roof (2-story)	11.00×19.10×17.85	7,791.8	81,282.23
Manila	Pandacan	Research Laboratory	Concrete with G. I. roof (2-story)	28.00×16.50×13.50	3,745.1	60,000.00
Do.	Binondo	Annex to Bureau of Forestry.	do.	16.00×20.35×12.50 8.30× 7.50×15.80	4,223.2	50,000.00
Mountain Province	Bontoc	Government Cottage	Wood with G. I. roof	7.00× 8.50–1.50× 4.40	281.3	2,650.00
Nueva Ecija	Cabanatuan	Courthouse	Concrete and wood with G. I. roof (2-story)	28.00×41.00×11.588	4,128.0	51,879.48
Do.	do.	Band Stand	Concrete with G. I. roof	9.13 Dia. ×12.07	616.6	7,275.17
Occidental Negros	Mambucal	Bathhouse	do.	20.06×14.46× 8.39	743.9	44,677.92
Do.	Murcia	Puericulture Center	Concrete and wood with G. I. roof (Type "A")	11.00× 8.00× 7.85	471.2	3,667.84
Do.	Kabankalan	do.	do.	20.00×12.50× 7.60	1,235.4	6,890.02
Do.	Talisay	Slaughterhouse	Concrete with G. I. roof	6.00× 4.00× 4.77	339.8	1,236.75
Pangasinan	Lingayen	Courthouse	Bricks with G. I. roof	9.80×24.40×12.17 8.20×63.10×12.17	7,304.3	26,500.00
Samar	Catarman	Teachers' Cottage	Concrete and wood with G. I. roof	13.00× 8.00× 4.50	585.0	26,436.32
Do.	do.	Granary	do.	21.00× 9.00× 3.00	830.3	

PORT WORKS CONSTRUCTION AND MAINTENANCE

PROVINCES

Butuan, Agusan.—Plans were prepared for a short extension of the existing wharf, to enable launches and small vessels to dock at any stage of the river. This improvement will be carried out as soon as funds are made available.

Legaspi, Albay.—A thorough re-survey was made of the proposed development of the port and extensive calyx drill borings were taken to determine the location of a coral stratum found on the south side of the proposed basin. As a result of the new conditions discovered, the diversion canal for the Tibu River was re-located and the basin greatly enlarged. Investigation was made of the ownership of property involved and the design of the breakwaters begun. The appropriation was to small to enable completion of a breakwater and advertisement was, therefore, delayed until the 1930 funds would be available.

Loay, Bohol.—Reconstruction of the channel markers was carried out, but no bids were received for furnishing the 400 cubic meters of rock needed to complete the jetties. This small item and a limited amount of dredging will be done by administration.

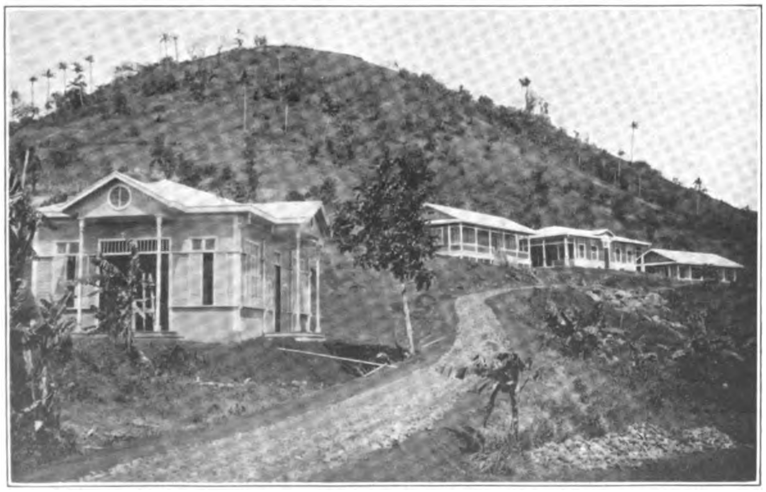
Tagbilaran, Bohol.—A small amount of improvement work was done in the form of widening a short section of the causeway leading to the wharf. With increasing traffic, it will be necessary to carry this work through at an early date and to provide turning and parking space for motor vehicles near the wharf.

Aparri, Cagayan.—The work at Aparri, Cagayan, consisted in the construction of 224 linear meters of reinforced concrete pile and slab jetty, by Mr. C. Russell, contractor, at cost plus 15 per cent. The extraordinarily precarious conditions prevailing at Aparri fully justified the execution of this work in this manner. The appropriation was exhausted and it is proposed to observe the effect of the completed section before attempting to construct the remaining 86 linear meters of the jetty as originally planned. Work on control of the Cagayan River at its mouth was initiated by the construction of 1,300 linear meters of palma brava pile hurdles above the town of Aparri and on the east side of the river. They functioned well, but were so damaged by the floods that it is evident better materials must be used. A total of ₱27,204 was expended on this work during the year and approximately 22 per cent of the work as originally planned was completed. The repair and continuation of the hurdles will be carried out next year, as it is evident that the river must be trained to a fixed location if the channel across the bar is to be available for shipping at all seasons.

Cebu, Cebu.—Improvement of the port of Cebu was carried on throughout the year. The Atlantic Gulf and Pacific Company made very satisfactory progress on the marginal wharf and pier No. 1. The former was approximately 40 per cent completed and the latter 100 per cent completed at the end of the year. The pier shed was not included in this contract and will be advertised under a separate proposal. Plans were prepared for a steel sheet-pile retaining wall in back of the old marginal wharf near Fort San Pedro in order that dredging for a 30-foot berth may be safely done. The work was advertised prior to the end of the year. It is proposed to complete the filing behind the new marginal wharf and to advertise early next year for the construction of another pier and the two pier sheds. It is also proposed to advertise for bids for the dredging of a portion of the fairway and berths.

Capiz, Capiz.—Construction of the South breakwater was continued by Contractor Gregorio Yotoko, the work starting in March. Over 100 linear meters were completed during the year and the South breakwater was approximately 95 per cent completed as of December 31st.

Construction of the North breakwater was carried on by administration, 100 linear meters being completed and 50 linear meters or 70 per cent completed during 1929, making the North breakwater about 88 per cent completed at the end of the year.



Bicol Leper Station, Legaspi, Albay

Normal School, Legaspi, Albay Province

Cotabato, Cotabato.—The only work done on the River Wall consisted in the placing of two mooring bitts and back-filling. Work was then suspended for lack of funds.

Parang and Polloc, Cotabato.—Surveys were made to determine the feasibility of developing a port at either of these adjacent places and it was found that Polloc is not a practicable location. A preliminary study was made of the character of works required at Parang, which seems to be the best site available.

Glan, Cotabato.—A survey was made and a preliminary layout prepared for a wharf at this isolated place, together with a tentative estimate. It will be feasible to provide adequate facilities at this port at a nominal figure, to take care of the interisland vessels that would call if a wharf were available.

Davao, Davao.—The rock-fill causeway to replace the wooden approach to the completed concrete pier was 67 per cent completed at the end of December, 1929. The work is being done by the Luzon Stevedoring Company, under contract. At Mati and Santa Filomena, Davao, small temporary landings were improved at provincial expense. A careful investigation was made of the possibility of developing a port at Pakiputan Straits, to serve the town of Davao and replace Santa Ana, the present port. In view of the swift currents and the great expense of constructing satisfactory deep berths, it was decided that the development should continue at Davao (Santa Ana).

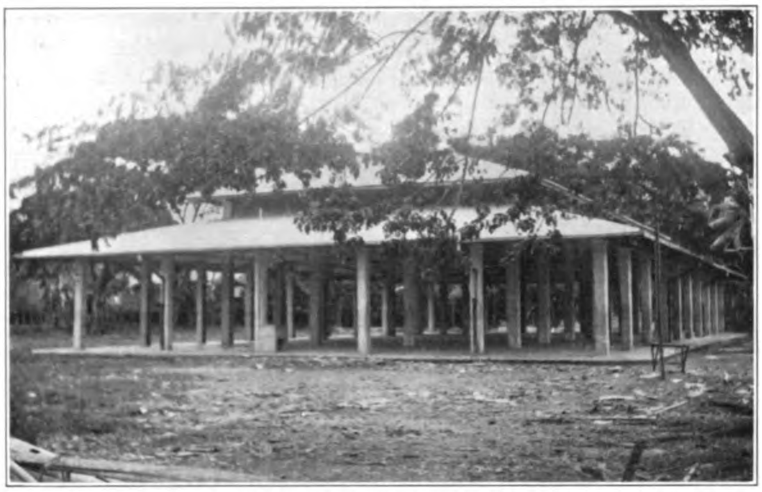
Currimao, Ilocos Norte.—With the small amount available, completion of the rock causeway was carried out. With the balance, a short marginal landing will be constructed for ships' boats and "virays."

San Ildefonso, Ilocos Sur.—Further study was made of the practicability of developing a port at this place and the Legislature again affirmed its desire that this project be carried out by reappropriating the funds which reverted while the matter was in controversy. The design of the port structures was awaiting the calyx drill borings at the close of the year.

San Esteban, Ilocos Sur.—A survey was made and preliminary study shows that an inter-island port can be readily developed at this place at nominal cost.

Iloilo, Iloilo.—Very good progress has been made on the Iloilo portworks projects. The contract for the Marginal Wharf became effective July 25, 1929, Tan C. Tee and Company being the contractors. By the end of the year, approximately 34.6 per cent of the job was completed and it is probable that the wharf will be in service well before the expiration of the contract time. The contract price totals approximately ₱1,000,000.

Dredging has been carried on steadily since March 4th and more than 300,000 cubic meters of spoil were excavated from the Lower Reach of the Iloilo River and deposited in the proposed Airport



Market Building, Banga, Capiz Province

reclamation. The unit cost was ₱0.30 per cubic meter and the work was done by Dredge No. 4, a 16-inch hydraulic machine. Approximately 160,000 cubic meters will be needed to complete the airport site. The Visayan Stevedore Transportation Company continued work on their contract for the construction of the rockfill Spur Dykes and Jetty Extension. Of a total estimated required amount of 40,000 metric tons, nearly 23,500 had been placed by the end of the year. Work was suspended during the adverse monsoon. The spur dykes have proven very effective.

Iligan, Lanao.—Satisfactory progress was made on the construction of the concrete pier by administration. Approximately 45 per cent of the pier was finished, except for the asphalt pavement. The work will be continued with the ₱25,000 appropriated for 1930.

San Fernando, La Union.—A study was made of the possibility of constructing breakwaters to protect the pier at San Fernando, but the cost would apparently be so great as to prohibit such works, in view of the limited use made of the port.

Tacloban, Leyte.—The deck of the 12 by 35 meter addition to the existing concrete wharf was completed and the fender clusters and lamp-posts finished. Piles were driven for one additional 2.5 meter panel. The total expenditures amounted to approximately ₱25,000.

Cagayan, Misamis.—Plans were prepared for the extension of the existing concrete wharf and the replacement of the short wooden approach by rock-fill. The latter was completed, but the advertisement of the extension was withheld so that the work could be planned to include the 1930 appropriation and thereby make the project sufficiently attractive to interest contractors.

Jimenez, Misamis.—A survey was made of the proposed site for over-seas port development.

Pulupandan, Occidental Negros.—The creosoted timber sea-wall and reclamation were completed and, by agreement, the proposed breakwater was eliminated. No further improvement at this port is contemplated for the present.

Dumaguete, Oriental Negros.—With an expenditure of ₱9,151, a concrete crib work was installed to retain the rock fill at the outer end of the causeway, where damage had been done by the waves from the southeast. The causeway road was also greatly improved by the application of an asphalt surface treatment.

Catbalogan, Samar.—The work of improvement of the existing causeway consisted of the partial completion of the replacement of the timber-pile connecting bridge with rock-fill, widening and raising the top elevation of the outer 60 lineal meters of the causeway and extending the "L" which protects the launch anchorage. A contract calling for about 10,000 tons of rock for this purpose was let and 31 per cent of the work was completed, the expenditures and obligations totalling approximately ₱61,000. Further improvement will consist of grouting the exposed face of the causeway, providing small boat landings and the construction of a concrete pier head.

Calbayog, Samar.—The construction of the east jetty was advertised for bids, but the only one received was deemed excessive and the work was ordered re-advertised. The second advertisement resulted in the receipt of only one bid, action upon which had not been accomplished at the end of the year.

Jolo, Sulu.—After a long period of preparation of materials, due to limited annual appropriations, actual construction of the improvement of the approach to the existing pier was started in June. The amount available was insufficient to interest contractors, and the work is being done by administration. The project comprises the construction of a gravity concrete retaining wall, on a pile foundation, and the reclaiming of the area between it and the present approach. The cost of the wall is estimated at about ₱80,000 and the appropriation available will suffice for about 25 per cent of the work. This improvement will greatly relieve present traffic congestion on the wharf approach.

Siasi, Bongao, Tandu Batu, and Cagayan de Sulu, Sulu Province.—The landings at these places were repaired and some improvement was made at the two last named, where the approach causeways were widened.

Baler, Tayabas.—A survey and study were made of possible port development at this isolated place, but the cost would be prohibitive, considering the character of facilities which could be obtained.

Mauban, Tayabas.—Plans were prepared for a boat and launch landing at this port.

Laguimanoc, Tayabas.—A survey and study were made of the proposed port development, but plans were not prepared, as the future traffic would probably require only the extension of the Railroad Company's landing.

Zamboanga, Zamboanga.—The work at this port consisted in the replacement of one-half of the wooden approach with concrete construction. The approach is 163 meters long and approximately 11.0 meters wide. The half-width was completed and opened to traffic in October. With the funds made available in 1930, it is hoped to complete the reconstruction of the approach, as repair of the temporary structure is not only expensive, but greatly inconveniences traffic. A survey was also made to secure data upon which to base the development of this port.

Dapitan (Pulanan Point) Zamboanga.—A survey and tentative design and estimate were made of the proposed pier for coastwise service on Dapitan Bay, at Pulanan Point. The project appears to be practicable, both physically and financially and will fill a very great need of this region.

Courthouse, Lingayen, Pangasinan Province

MANILA

The major portworks accomplishment at Manila was the reconstruction of the floors of Piers Nos. 3 and 5 and the construction of a permanent approach to Pier No. 5, for which purposes Bond Issue funds in the amount of ₱255,000 were expended. The usual routine maintenance and repair of the piers, cargo shed, breakwaters and river walls was carried on during the year at a cost of ₱100,000. The dredging equipment performed work as shown in the accompanying tabulation. Arrangments were completed for the acquisition of a new dredge, of the same type as the steamship *Dredger*, which will materially aid in the improvement and upkeep of the harbor.

DREDGING OPERATIONS—1929

Location	Total 1902 to 1928	Total for 1929	Steamship *Dredger*	Dredges							Total cubic meters
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	
	Cubic meters	*Cubic meters*									
Lower Pasig River	8,474.380	355,040	162,000	193,040							8,829.420
Outer Harbor	5,644,479	546,000	546,000								6,190,479
Upper Pasig River	1,067,253	7,715						4,449	3,266		1,074,968
Inner Basin	658,451	2,500	2,500								660,951
Binondo Estero	79,276	5,029						5,029			84,305
Estero de la Reyna	299,705										299,706
Pasig Estero	56,525	3,378						3,378			59,903
San Miguel Estero	65,386	12,881							12,881		78,267
Provisor Estero	40,276										40,276
Marine R. Ry Engineer Island	45,407	758						758			46,165
Talim Island (City)	1,071										1,071
Outer Bar	1,688,794	269,100	184,500	32,640		51,960					1,957,894
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580										16,580
Engineer Island Canal	40,740										40,740
Vitas Estero	893,000										893,000
Quiapo Estero	12,507										12,507
Segado Estero	35,509										35,509
Pandacan Estero	172										172
San Lazaro Estero	30,594										30,594
Corregidor Harbor (Q. M.)	63,746										63,746
Iloilo River	2,964,632	304,287					304,287				3,268,919
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	30,155	2,207						2,207			32,362
District of Cavite	20,876										20,876
Tondo Beach	129,184										129,184
Santibañes Estero	25,878										25,878
Tanque Estero	28,057										28,057
Tacloban Wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato River	49,462										49,462
Earnshaw's Slipways	55,113	27,000	27,000								82,113
Los Baños Pier	11,160										11,160
U. S. Navy Yard Cavite	1,312,160	4,000		4,000							1,316,160
Concordia Estero	16,298										16,298
Malabon Canal	36,821										36,821
Port Libas, Capiz	31,413										31,413
Napindan Bar	100,856										100,856
Polo Club	12,471										12,471
Sunog Apog Estero	14,850										14,850
Bankusay Estero	3,390										3,390
Varadero de Manila, Cavite	8,600										8,600
Ganado Estero		2,332						1,078	1,254		2,332
Totals	24,701,359	1,542,227	922,000	229,680		51,960	304,287	16,899	17,401		26,243,586

PORT WORKS PROJECTS COMPLETED OR UNDER CONSTRUCTION

Province	Project	Preliminary estimated cost	Total appropriations to December 31, 1929	Appropriations for 1929	Work completed	Proposed improvements	Depth of water	Remarks
							Feet	
Agusan	Port of Butuan	₱41,500.00	₱31,500.00	₱10,000.00	Concrete wharf, timber deck, 9.4 meters by 22.2 meters.	Extension of wharf	14	To enable small vessels to berth.
Do.	Port of Nasipit							Pending investigation.
Albay	Port of Legaspi [1]	3,000,000.00	250,000.00	150,000.00		Diversion canal, breakwater, reclamation, marginal wharves.	30	Diversion canal under contract.
Do.	Port of Tabaco						30	Pending investigation.
Antique	Port of San Jose [1]	410,000.00	80,000.00	5,000.00	Concrete wharf with timber deck, 9 meters by 22 meters.	280 lineal meters of rip-rap breakwater. Improvement of causeway.	20	
Batangas	Port of Batangas [1]	267,000.00	50,000.00	10,000.00	160 lineal meters of rip-rap approach and concrete landing, 6 meters by 10 meters.	R. C. pile and girder wharf 12 meters wide by 55 meters long with R. C. pile girder approach 9.3 meters by 58 meters.	20	Portion of old causeway placed before American occupation. New wharf to provide 20 feet depth.
Batanes	Basco Landing		10,000.00	9,000.00		Breakwater for small boats.		Under construction.
Do.	Port of Uyugan	5,000.00		5,000.00		Banca Channel, 10 meters by 103 meters.	3	
Bohol	Port of Tagbilaran [1]	225,000.00	181,000.00		487 lineal meters of causeway, R. C. concrete wharf with timber deck, 9 meters by 18 meters.	18 meters extension to present wharf. Improvement of approach.	16	Approach should be widened and parking space provided with shelter for cargo.
Do.	Port of Loay	165,000.00	63,500.00		755 lineal meters of rock jetties.	Completing jetties to 15 foot contour and removing rock from channel.	15	Principal port on Island of Bohol.
Cagayan	Port of Aparri [1]	2,000.000.00	380,000,00	150,000.00	224 lineal meters of jetty and 1,300 lineal meters of hurdles completed.	R. C. concrete wharf, 1,450 lineal meters of jetty. Completion of sea wall.	16	For 30-foot channel.. Additional training hurdles required.

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[1] Projects recommended by Advisory Board on Ports and Harbor Improvement.

PORT WORKS PROJECTS COMPLETED OR UNDER CONSTRUCTION—Continued

Province	Project	Preliminary estimated cost	Total appropriations to December 31, 1929	Appropriations for 1929	Work completed	Proposed improvements	Depth of water	Remarks
							Feet	
Capiz	Port of Capiz [1]	₱629,000.00	₱315,000.00	₱60,000.00	1,240 lineal meters of breakwaters.	Concrete wharf, 12 meters by 30 meters and completion of breakwaters and dredging.	14	To be dredged to 20 feet.
Do.	New Washington [1]	212,000.00	12,000.00		R. C. pile and slab, wharf, 31.10 meters long.	Concrete wharf, 12 meters by 30 meters.		New wharf should be constructed at Batan Point at 30 feet depth.
Cebu	Port of Cebu [1]	9,183,000.00	7,727,000.00	30,000.00	1,261 lineal meters of marginal wharf 18 to 30 feet, 300 lineal meters of rock jetty, one pier 30 meters by 150 meters.	3 piers, wharf, dredging and reclamation.	18–30	Pier No. 2 and 203 lineal meters of marginal wharf under construction.
Do.	Bantayan Wharf			10,000.00		Reconstruction of wharf		Pending investigation.
Do.	Jagnaya			5,000.00				Do.
Do.	Port of Pilar			3,000.00				Do.
Do.	Toledo Landing [1]	80,000.00	25,000.00	10,000.00		5 by 90 meters rock-fill approach with 12 by 34 meters landing of steel sheet piling and back-fill.	6	Plans completed.
Cotabato	Port of Cotabato	170,000.00	25,000.00		40 lineal meters	Concrete river wall, 230 lineal meters.		Lack of funds (suspended).
Do.	Port of Parang							Pending Investigation.
Davao	Port of Davao [1]		325,000.00	40,000.00	Concrete pier, 9 meters by 100 meters.	2 piers 61 meters by 190 meters, sandbreak 200 meters long.		Dredging, ₱60,000 expended on river channel improvement.
Iloilo	Port of Iloilo [1]	4,294,000.00	2,755,705.00	30,000.00	1,074 lineal meters of marginal wharf and rock-fill jetties at mouth.	1,042 lineal meters of marginal wharf, 250 lineal meters of marginal wharf in straits, completion of jetties at mouth of river.	18–30	Jetties and 1,042 lineal meters of marginal wharf under construction from funds provided by ₱4,500,000 bond issue.
Lanao	Port of Iligan [1]	155,000.00	75,000.00	25,000.00	90 lineal meters of causeway and 24 lineal meters of R. C. Pier 12 meters wide.	Extension of R. C. wharf 54 lineal meters.	12	To be dredged to 25 feet. Extension of pier under construction.
La Union	Port of San Fernando.[1]	250,000.00	153,000.00		Concrete wharf, 12.5 meters by 71.1 meters.	140, lineal meters of rock jetty and dredging.	12	To be dredged to 25 feet.
Leyte	Maasin			10,000.00				Pending investigation.
Do.	Port of Leyte	25,000.00		5,000.00	Concrete landing, rock-fill, 12 meters by 14 meters.			No water at low tide. Extension of 40 meters will give approximately 6 feet at low tide.
Do.	Port of Tacloban [1]	1,000,000.00	437,000.00	30,000.00	89 lineal meters of concrete wharf, 7,350 square meters of reclaimed land.	Extension of concrete wharf and reclamation of land.	18	To be dredged to 30 feet.
Masbate	Port of Masbate	No data						Pending investigation.
Marinduque	Boac Pier	40,000.00	40,000.00		R. C. boat landing			No further improvement contemplated.
Mindoro	Calapan Wharf	22,500.00	13,165.00		Concrete wharf, 6.5 meters by 16.9 meters.	No plans		Provincial project.
Oriental Misamis	Cagayan Wharf [1]	195,000.00	74,000.00	30,000.00	Concrete wharf 10 meters by 47.5 meters rock causeway 170 meters long.	Extension of wharf 47.5 meters and dredging to 25 feet.		Contract let for extension of wharf by units to extent of funds.
Do.	Mambajao Pier	70,000.00	5,000.00			15 meters by 75 meters causeway, precast slab and fill.	2–22	Suspended.
Romblon	Romblon Wharf	174,000.00			2 small R. C. wharves 9 meters by 12 meters each.	70 lineal meters concrete wharf, 10 meters wide.		₱150,000 needed for extension.
Occidental Misamis	Port of Jimenez	200,000.00				139 lineal meters of approach and 80 lineal meters of R. C. wharf.	30	Future.
Occidental Negros	Pulupandan Pier [1]	1,300,000.00	995,000.00		Concrete pier 21 meters by 167.5 meters, 280 meters, R. C. approach.	Cargo shed 11.25 meters 136 meters, breakwater.	30	Suspended lack of funds.
Do.	San Carlos Landing			40,000.00		Causeway and wharf.	12	Pending investigation.
Oriental Negros	Dumaguete Pier	400,000.00	329,000.00	10,000.00	Maintenance and improvement of the approach.	Maintenance and improvement of the approach.	15–30	Area back of approach to be filled in the future.
Palawan	Puerto Princesa			4,000.00	Concrete wharf 9 meters by 18 meters timber deck.	None	16	Repairs.
Samar	Port of Borongan						12	Pending investigation.
Do.	Port of Calbayog [1]	300,000.00	55,000.00	60,000.00	Approximately 700 lineal meters of rock jetty.	Extension of jetty to 6 foot contour and dredging.		
Do.	Catbalogan Pier	400,000.00	288,000.00	50,000.00		R. C. Landing at end of present causeway 9 meters by 30 meters. Basin for small craft.	14	Repairs due to 1928 typhoon. Made and timber span replaced with rock-fill.
Do.	Amandayan Landing	30,000.00						Future.
Siquijor	Larena Wharf		5,000.00	3,000.00	Timber boat landing	Repair of landing		No further improvements contemplated at present.
Do.	Lazi Pier	60,000.00	40,000.00		Rock causeway under construction.	200 lineal meters of causeway and concrete pier 9 meters by 10 meters.		Additional 20 lineal meters of causeway and concrete landing needed.
Sorsogon	Sorsogon Landing [1]	120,000.00	35,000.00		383 lineal meters of rock causeway and concrete landing stage for small boats.	Widening and extension of causeway.		₱70,000 needed to provide a good landing for small launches.
Sorsogon	Casiguran Landing [1]	120,000.00	49,000.00			Extension of causeway.		Under study.
Sulu	Port of Jolo [1]	377,000.00	210,000.00	30,000.00	Concrete wharf, 12.5 meters by 59.1 meters with 180 lineal meters of rubble concrete causeway.	90 lineal meters addition to wharf 180 lineal meters of gravity wall and reclamation.	30	

[1] Projects recommended by Advisory Board on Ports and Harbor Improvement.

PORT WORKS PROJECTS COMPLETED OR UNDER CONSTRUCTION—Continued

Province	Project	Preliminary estimated cost	Total appropriations to December 31, 1929	Appropriations for 1929	Work completed	Proposed improvements	Depth of water	Remarks
							Feet	
Surigao	Port of Surigao [1]	₱228,000.00	No data		Concrete wharf, 9.25 meters by 57 meters	Extension of wharf 12 meters by 57 meters.		₱114,000 required for extension.
Tayabas	Hondagua				Concrete pier			Constructed by Manila R. R. Co. ₱1,160,000.
Do.	Laguimanoc Pier	90,000.00				R. C. pier and riprap approach.	14	1.6 kilometers of roadway required at additional cost of ₱32,000 to connect to main road.
Do.	Mauban Landing			₱20,000.00	Causeway and landing for small boats.			
Do.	Puerta Real			25,000.00		Wharf for inter-island vessels.		Pending investigation. Contract let for portion of causeway.
Do.	Siain Landing			25,000.00				
Zamboanga	Port of Zamboanga		₱794,200.00	40,000.00	12 meters by 136 meters of concrete wharf, 12 meters by 44 meters of wooden wharf, 156 lineal meters of concrete approach, 75 lineal meters of wooden approach, 140 lineal meters of basin wall, 140 lineal meters of basin breakwater.	Replace wooden wharf and approach with concrete structures and construct basin for small boats, dredging and reclamation work. Extension of wharf.		
Manila	Pasig River Walls				990 lineal meters		6–10	
Do.	Muelle del Banco Nacional.	₱500,000.00	₱290,000.00		180 lineal meters	170 lineal meters	10–20	To extend present wall to the Jones Bridge.
Do.	Dredging the fairways and berths to 35 feet at M. L. L. W.							
Do.	Construction of jetties at mouth of Pasig River.	300,000.00				350 lineal meters of rock jetty on south side.		Contract let.
		365,000.00				300 lineal meters on north side.		Awaiting modification of existing agreement.
Do.	Improvement of berths of Pasig River below proposed bridge site.	1,500,000.00	No data			1,200 lineal meters of wall to be replaced by new work.	20	Present walls do not permit dredging to required depth.
Do.	Reclamation of an area for a fuel station.	2,450,000.00				Reclamation of 667,000 square meters of land, requiring 2,635 lineal meters of retaining walls.		
Do.	The lengthening of Piers Nos. 3 and 5 to same length as Pier No. 7.	1,800,000.00 2,250,009.00				Extension requires approximately 200 lineal meters for each pier.		
Do.	Construction of Pier No. 9.	8,000,000.00				67 meters by 427 meters		To be of the same size as Pier No. 7.
Do.	Dredging the south harbor where needed for additional deep anchorage to 35 feet.							
Do.	Pier No. 1				18 meters by 150 meters			Property of U. S. Army.
Do.	Pier No. 3	2,800,000.00	1,000.000.00		37 meters by 197 meters	37 meters by 230 meters addition, with shed.		
Do.	Pier No. 5		1,250,000.00		49 meters by 206 meters	49 meters by 221 meters addition with shed.		
Do.	Pier No. 7		12,000,000.00		67 meters by 400 meters			Cost includes cargo handling equipment and pier head.
Do.	Marginal Wharf and Cargo Shed.		1,325,000.00		30 meters by 290 meters			Between Piers Nos. 3 and 5.
Do.	Streets in South Port Area.		600,000.00		120,000 square meters of macadan surfaced streets, curbs and drains.	Completion of streets.		Maintained by City of Manila. Cost based on unit cost per square meter. Data lacking.
Do.	Oil Bunker Pier		25,000.00		Concrete Pile Bunker Head (completed).			For pipe line to U. S. Shipping Board (cost, ₱25,000).
Do.	North Breakwater	No data	No data		3,500 lineal meters of rock-fill (completed).			Started by Spanish Government and completed under present government.
Do.	South Breakwater	2,300,000.00	600,000.00		1,100 lineal meters of rock-fill.	1,500 lineal meters of rock breakwater.		To prevent sand drift into South Harbor.
Do.	Lower Pasig River Bridge.	3,000,000.00				Combined railroad and highway steel bridge.		

[1] Projects recommended by Advisory Board on Ports and Harbor Improvement.

AIDS TO NAVIGATION

During the first quarter of the year, the Bureau of Commerce and Industry was in charge of the construction and repair of all aids to navigation, as had been the case for several years. During the remainder of the year, however, this Bureau executed all work of repair on fixed structures and all new construction. There were nine new structures erected, thirteen rebuilt, and thirty-three repaired at a total cost of ₱217,720.40. The maintenance of lamp mechanisms and buoys was handled by the Bureau of Commerce and Industry, the total expenditures for that purpose amounting to ₱28,066.19.

ARTESIAN WELLS

The Insular appropriation of ₱200,000 for the drilling of artesian wells during the year 1929, permitted this Bureau to keep an average of only thirteen (13) drilling machines in active operation, out of the thirty (30) owned by the Government. This decrease in the number of drilling machines in the field caused a corresponding decline in the amount of work accomplished. Ninety-one (91) public artesian wells were completed during 1929, eighty-two (82) of which were successful and nine (9) unsuccessful.

In addition to the above one (1) private well was drilled for the Insular Lumber Company at barrio Fabrica, Sagay, Occidental Negros. The total cost of this well was paid by the Insular Lumber Company.

At the end of the year, there were pending applications for 253 artesian wells, from 101 municipalities.

The total number of successful artesian wells drilled from 1904 to 1929 is 2,117, aggregating a total cost of ₱5,033,303.68. These figures include the cost of private wells drilled from 1904 to 1923. These wells are capable of supplying a total of 52,042,900 gallons of potable water per 12-hour day which, at the rate of 20 gallons per capita, would supply no less than 2,602,145 people.

FUNDS EXPENDED

	1928		1929	
	Pesos	Per cent	Pesos	Per cent
Successful wells	239,188.39	94	188,115.78	87
Unsuccessful wells	14,925.38	6	27,328.06	13
Total	254,113.77	100	215,443.84	100

An amount of ₱4,000 from the 1929 Artesian Wells appropriation was allotted to the Bureau of Science for the purpose of making geological surveys and investigations to determine the probable success of drilling wells in doubtful localities or where a large percentage of unsuccessful wells have been drilled.

The strongest flowing well drilled during the year was in barrio Anunas, Urdaneta, Pangasinan, which has a yield of 300 gallons per minute, and was drilled to a depth of only 100 feet.

DRILLING MACHINES OPERATED BY BUREAU OF PUBLIC WORKS

Type of machine	In field	Stored at Warehouses at Manila	Stored in the provinces	Total
Cyclone (belongs to the Province of Bulacan)	1			1
Star		3	1	4
Standard			1	1
Columbia No. 3	10	3	1	14
Columbia No. 5	5	1	1	7
Columbia No. 10		3		3
Total	16	10	4	30

COMPARATIVE COST OF DRILLING

	1928	1929	Increase + and decrease —
A. Unsuccessful wells included:			
Per meter	₱24.58	₱23.40	— ₱1.18
Per foot	7.49	7.14	— .36
B. Not including unsuccessful wells:			
Per meter	24.21	22.61	— 1.60
Per foot	7.38	6.89	— .49

Cotabato River Wall

Zamboanga Concrete Wharf Approach, under construction

SUMMARY OF DEEP WELL DRILLING

	No. of wells drilled		Total depth in meters		Total flow in liters per minute	
	1928	1929	1928	1929	1928	1929
Successful:						
Flowing	27	17	3 447	2 022	8,476	3,115
Pumping	63	65	6,431	6 298	8 002	11.424
Total successful	90	82	9 878	8,321	16 478	14,539
Unsuccessful	3	9	457	886		
Grand total	93	91	10,335	9 207	16,478	14 539

BUREAU OF PUBLIC WORKS MACHINE SHOP

The following table shows the activities of the Bureau of Public Works Machine Shops during the years 1928 and 1929.

Year	Number of personnel	Work orders completed	Cost of material	Cost of labor	Total value of work
1928	76	1,026	₱51,606.70	₱52,055.07	₱103,661.77
1929	79	955	41,541.24	52,827.59	94,368.83

The Machine Shop performed work on the maintenance and repair of the artesian wells belonging to the City of Manila, for which work the City of Manila appropriated the sum of ₱2,000 for 1929.

The drilling of artesian wells is becoming more costly, for the reason that most of the municipalities located on good roads either have sufficient wells within the limits of their "poblaciones," or have constructed waterworks, which confines drilling operations largely to outlying municipalities and barrios where transportation for drilling machines and supplies is difficult and expensive.

SUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1929

Well No.	Location	Depth in feet	Diameter of casing	Capacity in gallons per minute	Date completed	Total cost
		Feet	*Inches*			
D-2494	Market Site, Sagay No. 9, Occidental Negros.	524	8,6,4½	P-15	2-24-29	₱4,578.85
D-2501	Barrio Cangana, Jetafe No. 13, Bohol.	118	6	P-20	1-30-29	2,190.07
D-2517	Barrio Mojon, Sogod No. 4, Cebu.	226	4½	P-20	1-12-29	2,080.72
D-2519	Barrio Maasin, San Ildefonso No. 6, Bulacan.	575	6,4½	P-37	1- 8-29	3,147.81
D-2528	Barrio Wawang-Polo, Polo No. 8, Bulacan.	550	4½	F-85	2-20-29	4,290.69
D-2531	Barrio Santo Cristo, San Antonio No. 7, Nueva Ecija.	670	4½	P-9	2- 5-29	4,637.54
D-2534	Barrio Pañgulo, Malabon No. 24, Rizal.	515	6,4½	F-20	1-10-29	2,719.70
D-2536	Poblacion, Urbiztondo No. 6, Pangasinan.	191	4½	P-11	1- 9-29	792.01
D-2537	Insular Asylum, San Felipe Neri, Rizal.	422	8.6	P-60	1- 6-29	2,791.63

SUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1929—Continued

Well No.	Location	Depth in feet	Diameter of casing	Capacity in gallons per minute	Date completed	Total cost
		Feet	*Inches*			
D-2538...	Barrio Banban, Jetafe No. 14, Bohol.	250	6	P-10	3-13-29	₱2,359.62
D-2539...	Poblacion, Ubay No. 4, Bohol.	125	8	P-10	4-27-29	2,448.29
D-2543...	Barrio San Alejandro, Quezon No. 6, Nueva Ecija.	360	6	P-60	1-16-29	3,176.69
D-2544...	Barrio Santa Rita, Quezon No. 7, Nueva Ecija.	439	4½	P-30	3-16-29	3,783.87
D-2545...	Barrio Pasolo, Polo No. 9, Bulacan.	585	6,4½	F-35	4-21-29	4,808.62
D-2546...	Poblacion, Agno No. 3, Pangasinan.	643	4½	P-5	1-31-29	1,390.79
D-2547...	Welfareville, San Felipe Neri No. 17, Rizal.	359	8	P-60	2-11-29	3,293.74
D-2548...	Barrio Palohanan, Bolbok No. 9, Batangas.	580	4½	P-22	4- 9-29	5,505.28
D-2549...	Barrio Catmon, Malabon No. 22, Rizal.	550	4½	P-17	2-28-29	3,044.28
D-2550...	Barrio Malipangpang, San Ildefonso No. 7, Bulacan.	710	4½	F-20	5-11-29	7,427.09
D-2551...	Barrio Bonol, Urbiztondo No. 7, Pangasinan.	164	4½	F-20	1-28-29	1,064.48
D-2552...	Barrio Tikiw, San Antonio No. 8, Nueva Ecija.	256	4½	F-20	3- 4-29	1,587.02
D-2553...	Barrio Real, Urbiztondo No. 8, Pangasinan.	212	4½	P-25	4-18-29	1,515.81
D-2554...	Poblacion, Infanta No. 1, Pangasinan.	700	4½	P-10	5-27-29	7,098.10
D-2555...	Barrio Glarin, Urbiztondo No. 9, Pangasinan.	95	4½	P-60	3- 6-29	1,144.80
D-2556...	Barrio San Mariano, San Antonio No. 9, Nueva Ecija.	207	4½	P-15	4- 6-29	2,031.16
D-2557...	Barrio Real, Urbiztondo No. 10, Pangasinan.	144	4½	P-20	4- 6-29	1,180.83
D-2558...	Barrio Pasong-tamo, Caloocan No. 21, Rizal.	307	4½	P-20	4-25-29	2,503.54
D-2559...	Poblacion, Tabogon No. 5, Cebu.	295	4½	P-15	4- 9-29	1,564.49
D-2560...	Barrio Santa Cruz, Bantayan No. 6, Cebu.	65	8	P-20	7-21-29	4,022.04
D-2561...	Barrio Bulacao, Cebu No. 64, Cebu.	420	8	P-150	10-23-29	4,293.88
D-2562...	Barrio Basac-San Nicolas, Cebu No. 65, Cebu.	97	6	P-150	11- 6-29	437.76
D-2563...	Barrio Magbaling, Cebu No. 66, Cebu.	174	6,4½	P-25	11-26-29	738.48
D-2564...	Barrio Public Plaza, Manaoag No. 11, Pangasinan.	345	6	P-15	4-26-29	3,475.20
D-2566...	Barrio Casanova, Quezon No. 8, Nueva Ecija.	337	6	F-5	4-14-29	2,631.90
D-2567...	Barrio Entablado, Cabiao No. 11, Nueva Ecija.	669	3	P-10	7-26-29	4,593.47
D-2568...	Barrio Maysan, Polo No. 10, Bulacan.	295	8,6,4½	F-30	6- 1-29	2,637.66
D-2570...	Barrio Altura, Tanauan No. 24, Batangas.	761	6	P-20	6-21-29	3,188.88
D-2571...	Barrio Talipapa, Caloocan No. 22, Rizal.	380	4½	P-150	5-28-29	1,076.17
D-2572...	Barrio Talipapa, Sur. Cabanatuan No. 30, Nueva Ecija.	696	6	F-5	7-27-29	7,279.37
D-2573...	Barrio Muzon, Taytay No. 13, Rizal.	225	8,6	P-30	7-17-29	4,477.06
D-2574...	Barrio Babasit, Manaoag No. 12, Pangasinan.	164	8	P-40	5-23-29	1,668.00
D-2575...	Santa Clara Street, San Ildefonso No. 8, Bulacan.	480	6	F-15	7-17-29	2,244.40
D-2576...	Barrio Cangcong, Caloocan No. 23, Rizal.	350	4½	P-35	6-27-29	1,017.01
D-2577...	Barrio Laoac, Manaoag No. 13, Pangasinan.	87	6	F-60	6- 6-29	826.78
D-2578...	Poblacion, Infanta No. 2, Pangasinan.	700	4½	P-5	7-31-29	1,965.88
D-2579...	Barrio Bonol, Urbiztondo No. 12, Pangasinan.	175	6	P-150	6-24-29	1,825.59
D-2580...	Market Site, Obando No. 15, Bulacan.	687	8,6,4½	F-13	9-21-29	4,253.35
D-2581...	Barrio Limansangan Binalonan No. 20, Panggasinan.	203	6,4½	F-40	6-26-29	1,686.16
D-2583...	Barrio Malibong, Urbiztondo No. 13, Pangasinan.	162	6	P-28	7- 9-29	774.45
D-2584...	Barrio Luyos, Tanauan No. 25, Batangas.	560	6	P-10	8-17-29	2,179.55
D-2585...	Barrio Macapatag, San Francisco No. 2 (Camote Island), Cebu.	735	6,4½	P-3	11-8-29	4,270.10
D-2586...	Barrio Calas, Caloocan No. 24, Rizal.	335	6	P-20	8-31-29	1,931.01
D-2587...	Barrio Sumabnit, Binalonan No. 21, Pangasinan.	132	6	P-60	7-16-29	1,222.65
D-2588...	Barrio Dalañgiring, Urbiztondo No. 14, Pangasinan.	144	6	P-150	7-22-29	472.99
D-2589...	Barrio Bugayong, Binalonan No. 22, Pangasinan.	216	6,4½	P-150	8- 3-29	₱2,150.38
D-2590...	Barrio Baro, Asingan No. 5, Pangasinan.	97	8	P-150	8-31-29	843.42
D-2591...	Barrio Santa Ana, Taytay No. 14, Rizal.	305	8	P-20	8-29-29	1,499.95
D-2592...	Poblacion, Urbiztondo No. 15, Pangasinan.	162	6	F-48	8- 3-29	652.67
D-2593...	Barrio Palasinan, Cabiao No. 12, Nueva Ecija.	397	6,4½	P-30	9-11-29	2,046.88
D-2594...	Poblacion, Dasol No. 1, Pangasinan.	200	8	P-10	9- 9-29	2,005.82
D-2595...	Barrio Concepcion, Baliuag No. 9, Bulacan.	562	6	F-60	10-29-29	3,661.80
D-2596...	Poblacion, Urbiztondo No. 16, Pangasinan.	173	6	F-27	8-20-29	669.99
D-2597...	Poblacion, Urbiztondo No. 17, Pangasinan.	172	8	F-10	9- 9-29	818.17
D-2598...	Barrio Bilogbilog, Tanauan No. 26, Batangas.	357	6	P-15	10-11-29	2,071.66
D-2599...	Barrio Dupac, Asingan No. 6, Pangasinan.	107	8,6,4½	F-25	9- 7-29	766.54
D-2600...	Mabini Street, Binangonan No. 19, Rizal.	218	6	P-84	10- 3-29	2,317.55
D-2601...	Barrio Salapang, San Juan del Monte No. 12, Rizal.	370	6	P-15	10- 2-29	1,246.15
D-2602...	Barrio Dumanpot, Asingan No. 7, Pangasinan.	105	8,6,4½	P-25	9-26-29	633.85
D-2603...	Poblacion, Dasol No. 2, Pangasinan.	415	6	P-5	9-26-29	816.51
D-2604...	Poblacion, Lupao No. 1, Nueva Ecija.	641	4½	P-25	12- 7-29	4,229.28
D-2605...	Barrio Santol, Bigaa No. 7, Bulacan.	360	6	F-75	11-12-29	2,079.43
D-2606...	Barrio Ignia, Dasol No. 3, Pangasinan.	175	8	P-15	10-28-29	1,050.38
D-2607...	Barrio Dumanpot No. 1, Asingan No. 8, Pangasinan.	111	8,6	P-75	10-14-29	809.52
D-2608...	Barrio Bilibiran, Binañgonan No. 20, Rizal.	256	6	P-60	10-15-29	1,813.66
D-2610...	Barrio Napuntod, San Juan del Monte No. 13, Rizal.	510	6	P-22	11-16-29	1,669.36
D-2612...	Barrio Toboy, Asingan No. 9, Pangasinan.	95	4½	P-120	11- 4-29	784.34
D-2614...	Barrio Turac, San Carlos No. 16, Pangasinan.	128	8	P-150	11- 7-29	637.54
D-2617...	Barrio Guadalupe, Cebu No. 67, Cebu.	196	6,4½	P-20	12-26-29	513.23
D-2622...	Barrio Dumpay, San Carlos No. 17, Pangasinan.	126	6	P-150	12-21-29	957.51
D-2625...	Barrio Tayuman, Binañgonan No. 21, Rizal.	280	6,4½	P-150	12-25-29	1,359.62
D-2626...	Barrio Kay-Mio-Hulo, San Felipe Neri No. No. 18, Rizal.	315	6	P-20	12-19-29	1,178.36
D-2630...	Barrio Anunas, Urdaneta No. 22, Pangasinan.	100	6	P-300	12-21-29	484.99
	Total............	27,299	....	3,841	....	188,115.78

UNSUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1929.

Well No.	Location	Date completed	Depth	Diameter of casing	Total cost	Remarks
			Feet	*Inches*		
2518..	Poblacion, Tabogon No. 4, Cebu.	3- 4-29	115	....	₱1,821.04	Salty water.
2532..	Rizal Street, Sagay No. 10, Occidental Negros.	6-19-29	688	8,6,4½	6,308.85	Do.
2540..	Sitio Rita, Ubay, Bohol.	10-19-29	624	....	6,728.82	Do.
2565..	San Francisco No. 1, (Camote Island), Cebu.	6-16-29	95	6	3,560.79	Do.
2569..	Barrio Bayaoas, Urbiztondo No. 11, Pangasinan.	5-27-29	459	....	1,571.74	No water.
2582..	Barrio Atitino, Aparri No. 3, Cagayan.	10- 9-29	373	....	4,352.24	Do.
2609..	Barrio Cawayan-Quiling, San Carlos No. 15, Pangasinan.	10-21-29	326	....	1,059.81	Do.
2611..	Barrio Toran, Aparri No. 4, Cagayan.	11-13-29	140	....	1,105.00	Do.
2627..	Barrio Santiago, San Francisco No. 3 (Camote Island), Cebu.	12-15-29	88	....	819.77	Do.
	Total....................		2,908	....	27,828.06	....

WELLS UNDER CONSTRUCTION AS OF DECEMBER 31, 1929

Well No.	Location	Date commenced	Depth	Diameter of casing	Capacity in gallon per minute	Partial cost
			Feet	*Inches*		
2541..	Sitio Rita, Ubay No. 6, Bohol.	10-20-29	365			₱2,228.55
2613..	Plaza Braulio Rivera, Tondo, Manila No. 38, Manila.	10-30-29	493	8 and 6		2,016.54
2615..	Barrio Makimbang, Baliwag No. 20, Bulacan.	10-30-29	534		P-50	2,035.21
2616..	Barrio Tallugan No. 2, Aparri No. 5, Cagayan.	11-14-29	260			1,115.53
2618..	Barrio Guadalupe, Cebu No. 68, Cebu.	12-27-29				
2623..	Poblacion, Burgos No. 1, Pangasinan.	10-29-29	960			2,237.94
2624..	Barrio Burol Segundo, Bigaa No. 8, Bulacan.	11-13-29	428			1,485.72
2628..	Barrio San Pablo, Aliaga No. 15, Nueva Ecija.	11-27-29	252			₱735.76
2629..	Barrio San Isidro, Lupao No. 2, Nueva Ecija.	12- 8-29	91	8	P-25	433.34
2632..	Barrio Basista, San Carlos No. 17, Pangasinan.	12-22-29				147.86
2633..	Barrio Vicente West, Urdaneta No. 23, Pangasinan.	12-22-29	200			158.08
2634..	Barrio Santiago No. 2, San Francisco No. 4, (Camote Island), Cebu.	12-16-29	133			190.80
	Total		3,716			12,785.33

SUMMARY OF WORK ACCOMPLISHED BY EACH WELL BORING RIG IN OPERATION DURING 1929

Rig No.	Wells completed			Capacity in gallons per minute		Depth in feet		Amount expended				Repair jobs undertaken		Period of operation
	Successful		Unsuccessful					Successful			Unsuccessful			
	Flowing	Pumping		Flowing	Pumping	Successful	Unsuccessful	Flowing	Pumping	Total		Job No.	Days employed	
1-A	1			85		550		4,290.69		4,290.69				1- 1-29 to 3-17-29
3	2	10		360	700	1,762		1,311.77	14,040.06	15,351.83		4	269	1- 1-29 to 12-31-29
6		1	2		3	735	183	4,270.10		4,270.10	4,350.56			1- 1-29 to 12-31-29
10			2				513				5,457.24			6-30-29 to 12-31-29
11		7			464	2,065			16,553.21	16,553.21		2	104	1- 1-29 to 12-31-29
12		6			50	2,833			14,327.48	14,327.48				1- 1-29 to 12-31-29
15	4			153		1,927		13,779.06		13,779.06				1- 1-29 to 12-31-29
17	2	2		10	90	1,832		9,911.27	6,960.56	16,871.83				1- 1-29 to 12-31-29
18	3	1		95	37	2,327		13,333.29	3,147.81	16,481.10		1	12	1- 1-29 to 12-31-29
19		6			109	2,840			19,125.35	19,125.35				1- 1-29 to 12-31-29
21		1	1		15	524	688		4,578.85	4,578.85	6,308.85			1- 1-29 to 6-19-29
21		(1)			(40)	(382)			(3,064.86)	(3,064.86)				6-20-29 to 12-31-29
23	4	9	2	100	744	2,048	785	3,205.31	9,301.44	12,506.75	2,631.55	2	16	1- 1-29 to 12-31-29
24		3	1		40	493	624		6,997.98	6,997.98	6,728.82			1- 1-29 to 12-31-29
25												1	27	5- 9-29 to 6- 4-29
26		4			67	2,258			12,945.37	12,945.37				1- 1-29 to 12-31-29
27		7	1		400	1,473	115		13,650.60	13,650.60	1,821.04			1- 1-29 to 12-31—9
28	1	8		20	299	3,632		2,719.70	13,665.88	16,385.58				1- 1-29 to 12-31-29
Total	17	65	9	823	3,016	27,299	2,908	52,821.19	135,294.59	188,115.78	27,328.06	10	428	

DESIGNING DIVISION

J. C. COOKINGHAM, *Chief Designing Engineer*

There was a noticeable increase in the demand for plans from the Designing Division throughout the year, due to the increased appropriations for bridge and port structures. In addition to the usual insular and provincial projects, plans and specifications were completed for the City of Manila, for a four-way traffic thru riveted steel bridge of two spans, to be constructed on the site of the old Colgante suspension bridge. An usually large number of bridge investigations were made and preliminary estimates completed in preparation for increased activity in bridge construction during the coming year, made possible by the creation of a Revolving Fund of five million pesos for the construction of permanent bridges on interprovincial and provincial roads.

The appointment of a Supervising Portworks Engineer during the early part of the year materially expedited the necessary investigations and preparation of plans for port structures. However, the lack of sufficient experienced designing engineers to properly cope with the increasing amount of work continued to be a serious handicap in the preparation of plans.

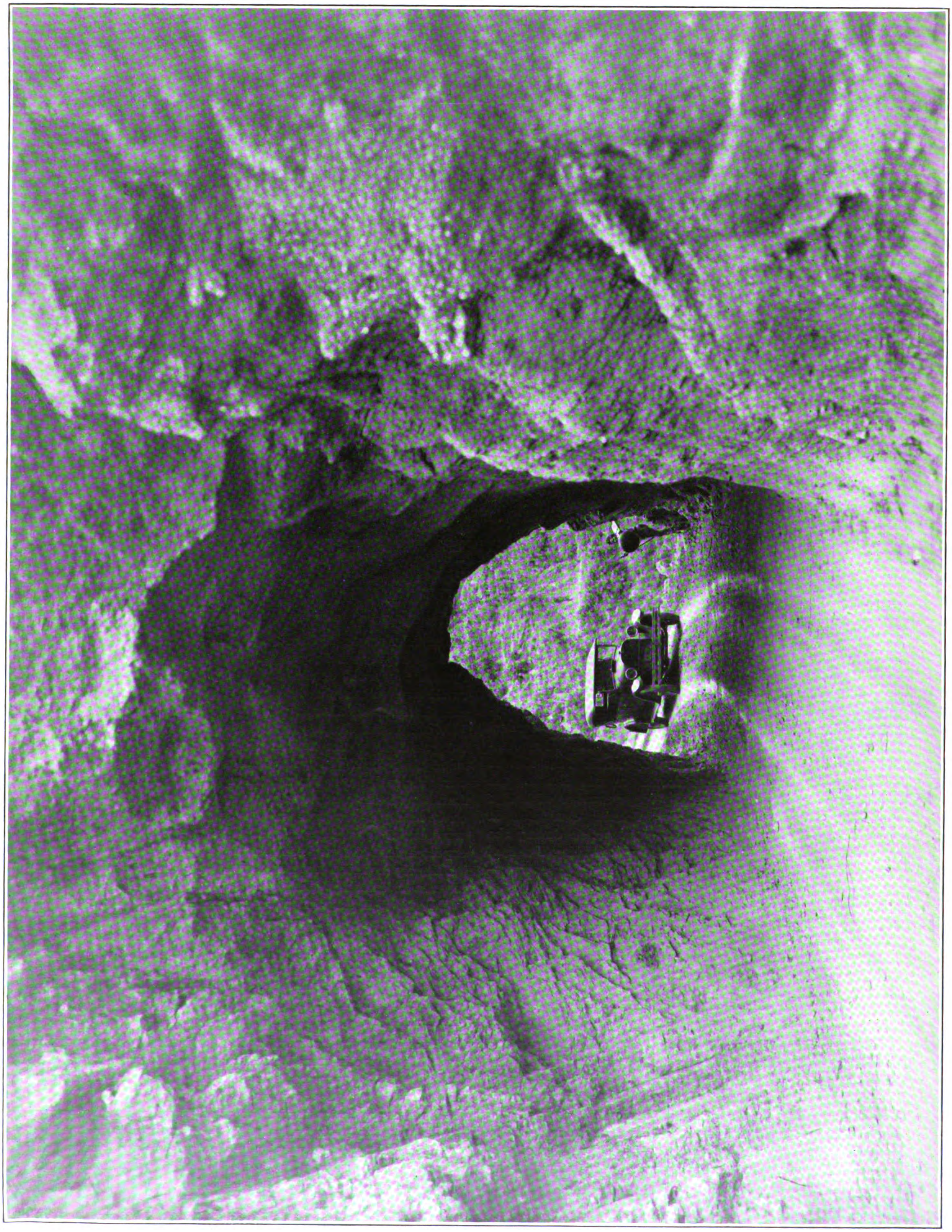
The amount appropriated annually for the investigation and survey of portworks projects and foreshore leases has been found to be entirely inadequate for the purpose. It is impossible to properly design portworks without detailed data covering existing conditions, and any attempt to do so will inevitably result in defective plans, or unduly high costs. This important phase of the country's needs should be studied and planned in a systematic manner.

There has continued to be considerable activity in the installation of pumping plants principally from artesian well sources for municipal waterworks and government institutions. Where pure spring water is not available at suitable elevations and distances for a gravity supply, these pumping systems provide a most satisfactory system for small communities. Pure water is obtained at a very small per capita cost for pumping and without the expense and complications of filtering.

Work on the development of new municipal electric lighting plants has practically ceased. On the one hand, the Insular Auditor has ruled that municipal governments are not enabled by law to enter the light and power business as a public utility, so that a legislative franchise is now necessary for a municipal government to embark on such a project; and on the other, private initiative has become very active in seeking franchise and installing plants. It is to be expected that the work of this bureau in this line will, in the future, be largely confined to plant extensions and assisting in the maintenance of existing plants.

Due to the large number of bridges to be financed from the Revolving Fund, it has been impossible to meet all requests from district engineers for test borings, with the five calyx drill outfits owned by the Bureau. Preference was therefore given to those projects for which funds were available and to the more important bridge projects it is proposed to finance from the Revolving Fund. Coöperation on the part of district engineers in inspecting, checking and approving boring samples and reports has been of great help in obtaining more accurate and reliable data on sub-soil conditions. The three Bureau-owned cement gun outfits were used continuously throughout the year on concrete bridge and wharf repair jobs in Manila and various provinces.

The systematic testing of the cement and concrete aggregates used in Government work and also of the concrete itself was carried on as usual. The Government-manufactured "Apo" cement maintained its record of uniformly high quality and no test failure occurred.



ACAB TUNNEL, KM. 10, BONTOC-CERVANTES ROAD, MOUNTAIN PROVINCE

In general, the concrete produced was very satisfactory and in most of the cases where it failed to meet the specified compressive strength, it appears probable that excess water was used in the mixture. The use of diatomaceous silica was permitted in casting heavy concrete piles and the tests on the samples indicate a very uniform and dense concrete, with unusually high compressive strength. Experience with this material, thus far, warrants the conclusion that it apparently increases the workability, density and strength of concrete.

The following tabulation shows the number of tests made on concrete materials during the year by the Bureau of Science for the information of this Bureau:

Total tests on cement from Bureau of Public works and Bureau of Supply (1/10 barrels tested)	21,316
Total tests on concrete	8,372
Total tests on sand	36
Total tests on gravel	28

The first two items show a substantial increase over the corresponding figures for 1928, while the decrease in the number of sand and gravel tests logically follows the accumulation of data on the sources of concrete aggregates.

A total of 1,482 foreshore lease and land sales applications were investigated and reported on for the Bureau of Lands, an increase of nearly 44 per cent over the total for 1928.

Plans, specifications, and estimates for projects covering bridges, port works, wiring of public buildings for electric lighting, pumping and power plants and other structures, as well as the more important activities of this division in the field, covering investigations, inspections, surveys, operation of cement gun, sand blast and calyx core drill outfits, installations and construction are listed in Tables A, B, C, D, E, F, G, H, I, and J.

TABLE A.—BRIDGES

Province	River	Road	Type and Length in meters	Remarks
Agusan	Simulao	At Bunawan	Suspension, 67.1	Preliminary plan and estimate.
Do.	Tagibu	Butuan-Cabadbaran.	Steel truss, 49.7	Do.
Baguio	Dungon	Benguet-Pangasinan.	Bry. steel truss, 37.4.	Plans and specifications.
Bataan	San Vicente Orion.	Orion-South	R.C.girders, 16.0.	Preliminary plan and estimate.
Bataan	Talisay	Balanga-South	R.C.girders, 81.0.	Plans and specifications.
Batangas	Bayudbud	Batangas-Cavite	R. C. Arch, 30.0.	Do.
Bohol	Manaba	Tagbilaran-East.	Steel truss, 49.7	Preliminary plan and estimate.
Cagayan	Babogan	Tuguegarao-Alcala.	Steel truss, 46.7	Do.
Do.	Pinacanauan	Cagayan-Valley.	Steel truss, 198.5.	Do.
Do.	Pared	do	Steel truss, 148.9.	Do.
Camarines Norte	Daet	Daet-Basud	Steel truss, 80.8	Plans and specifications.
Camarines Sur	Agus	Bato-Polangui	Steel truss, 74.7	Preliminary plan and estimate.
Do.	Bicol	Naga-Milaor	Steel truss, 80.8	Do.
Capiz	Makato	Capiz-West	R. C. girder, 33.0	Do.
Do.	Aranguel	Capiz-West	Steel truss, 46.7	Do.
Do.	Panay	Dao-Cuartero	Timber span, 61.0.	Plans and specifications.
Cebu	Daan-Bantayan	Municipal	R. C. girder, 27.0.	Do.
Do.	Inayagan	Cebu-South	Steel truss, 31.2	Do.
Do.	Liloan	Liloan-Tayud	Timber span, 12.0.	Do.
Davao	Talomo	Davao-South	Steel truss, 25.0	Preliminary plan and estimate.
Do.	Sibulan	Davao-South	Steel truss, 25.0	Plans and specifications.
Ilocos Sur	Amburayan	Manila-North	Steel truss, 496.2. Steel truss, 344.3.	Preliminary plan and estimate. Do.
Do.	Abra	do	Steel truss, 297.3.	Do.
Do.	Ursadan	Tagudin-Servantes.	Steel truss and R. C. girder, 63.7.	Plans and specifications.
Iloilo	Guimbal	Iloilo-South	Steel truss, 347.3.	Preliminary plan and estimate.
Do.	Jalaur	Pototan-Barotac	Steel truss, 121.1.	Do.
Do.	Iloilo	Iloilo-South	R. C. Arch, 12.0.	Plans and specifications.

TABLE A.—BRIDGES—Continued

Province	River	Road	Type and Length in meters	Remarks
Laguna	Lewin	Pagsanjan-Luisiana.	Steel truss, 15.9	Preliminary plan and estimate.
Laguna	Biñan	Investigation of strength of steel superstructure for the installation of sidewalks.		
Do.	Santa Cruz	Investigation of strength of steel superstructure.		
Do.	San Diego	Investigation of stability.		
Lanao	Agus	Camp Keithley-Dansalan.	Steel truss, 40.5	Preliminary plan and estimate.
La Union	Nagrebcan	Luna-Balaoan	R. C. girder, 18.0	Do.
Do.	Naguilian	Bauang-Ribsuan	Steel truss, 93.1	Do.
Do.	Cupang	Camp One-Aringay	R.C. girder 30.0	Plans and specifications.
Leyte	Calogcog	Polo-South	R.C. girder, 27.0	Preliminary plan and estimate.
Do.	Mangonbangon	Leyte High School.	R.C.girder, 12.0	Do.
Manila	Pasig	Calle Mendiola Extension.	Steel truss, 4-way traffic and electric cars with sidewalks, 251.6.	Do.
Do.	do	do	Steel truss, 2-way traffic only with sidewalks, 221.0.	Do.
Do.	do	do	Steel truss, 1-Pier 2-abuts. transfering Ayala Bridge superstructure, 136.3	Do.
Do.	do	Ayala Boulevard	Steel truss, 4-way traffic with sidewalks, 136.3.	Preliminary plan and estimate.
Do.	do	Calle Colgante	Steel truss, and R. C. girder, 4-way traffic with sidewalks, 242.8.	Final plans 75 per cent finished.
Do.	do	do	R. C. arch, 4-way traffic with sidewalks, 206.6.	Preliminary plan and estimate.
Mindoro	Pula	Calapan-Pinamalayan.	Steel truss, 49.7	Do.
Misamis	Cagayan	Cagayan-West	Steel truss, 198.5.	Do.
Nueva Ecija	Peñaranda	Manila-North	Steel truss, 222.5.	Do.
Occidental Negros.	Sicaba	Bacolod-North	Steel truss, 49.7	Do.
Oriental Negros	Ayungon	Dumaguete-North.	R.C.girder, 45.0	Do.
Pampanga	Sapang-Balen	Manila-Tarlac	R.C.girder,12.0,	Plans and specifications.
Pangasinan	Manila R. R.	San Fabian-Damortis.	R.C.girder, 7.0	Preliminary plan and estimate.
Do.	Sapang	Lingayen-Pao	Steel truss, 99.3	Do.
Do.	Aloragat	Binalonan-Pozorrubio.	R.C.girder, 120.0	Do.
Do.	Paitan	Lingayen-Alaminos.	Steel truss, 49.7	Plans and specifications.
Rizal	Ampit	Pasig-Montalban.	R.C.girder, 24.0	Preliminary plan and estimate.
Do.	Mariquina	Manila-Mariquina.	Steel truss, 121.1.	Do.
Samar	Borongan		Timber truss, 46.7.	Do.
Sorsogon	Bulusan	Gubat-Bulusan	Steel truss, 46.7	Plans and specifications.
Tarlac	Tarlac	Tarlac-Camiling.	R.C. girder, 17.0	Do.
Standards			Steel truss, 139.8.	Design.
			50-foot steel truss 18-foot roadway.	
Do.			80-foot steel truss 18-foot roadway.	Do.
Do.			90-foot steel truss 18-foot roadway.	Do.
Do.			100-foot steel truss 18-foot roadway.	Do.
Do.			120-foot steel truss 18-foot roadway.	Do.
Do.			140-foot steel truss 18-foot roadway.	Do.
Do.			160-foot steel truss 18-foot roadway.	Do.

TABLE B.—PORTWORKS

Province	Port	Type of construction	Remarks
Bohol	Loay	Improvement	Beacons repaired and jetty work advertised.
Bohol	Tagbilaran	Improvement	Approach. widened.
Cagayan	Aparri	R. C. jetty and wooden hurdles.	234 L. M. of jetty constructed and 1,300 meters of palma brava hurdles finished.
Cebu	Cebu	R. C. pile pier and marginal wharf.	Pier completed. Marginal wharf 40 per cent complete.
Capiz	Capiz	Breakwaters	North breakwater 88 per cent complete.
			South breakwater 95 per cent complete.
Cotabato	Cotabato	River Wall	Mooring bitts and back fill placed.
Davao	Davao	Rock causeway approach.	Sixty-seven per cent completed. Survey and study.
Ilocos Norte	Currimao	Landing	Causeway completed. Plan of marginal landing prepared.
Iloilo	Iloilo	R. C. Marginal Wharf.	Under contract. 35 per cent completed.
Do	do	Spur Dykes	Sixty per cent completed.
Do	do	Dredging	Three hundred thousand cubic meters removed.
Lanao	Iligan	R. C. Pier	Forty-five per cent completed.
Leyte	Tacloban	R. C. Wharf Extension.	Thirty-five L. M. completed.
Misamis	Cagayan	R. C. Wharf Extension.	Rock-fill approach completed.
Manila	Manila	Improvement Piers 3 and 5.	Completed.
		Dredging	Underway.
Occidental Negros	Pulupandan	R. C. Pier	Completed.
		Timber sea wall and reclamation.	Completed.
Oriental Negros	Dumaguete	Maintenance and improvement.	Causeway repaired and approach asphalted.
Samar	Catbalogan	Rock causeway	Work continued under contract.
Sulu	Jolo	Gravity wall and reclamation.	Twenty per cent of wall completed.
Zamboanga	Zamboanga	R. C. approach	One-half of approach completed.

TABLE C.—WIRING OF BUILDINGS, PARKS, FOUNTAINS, BRIDGES, AND WHARVES

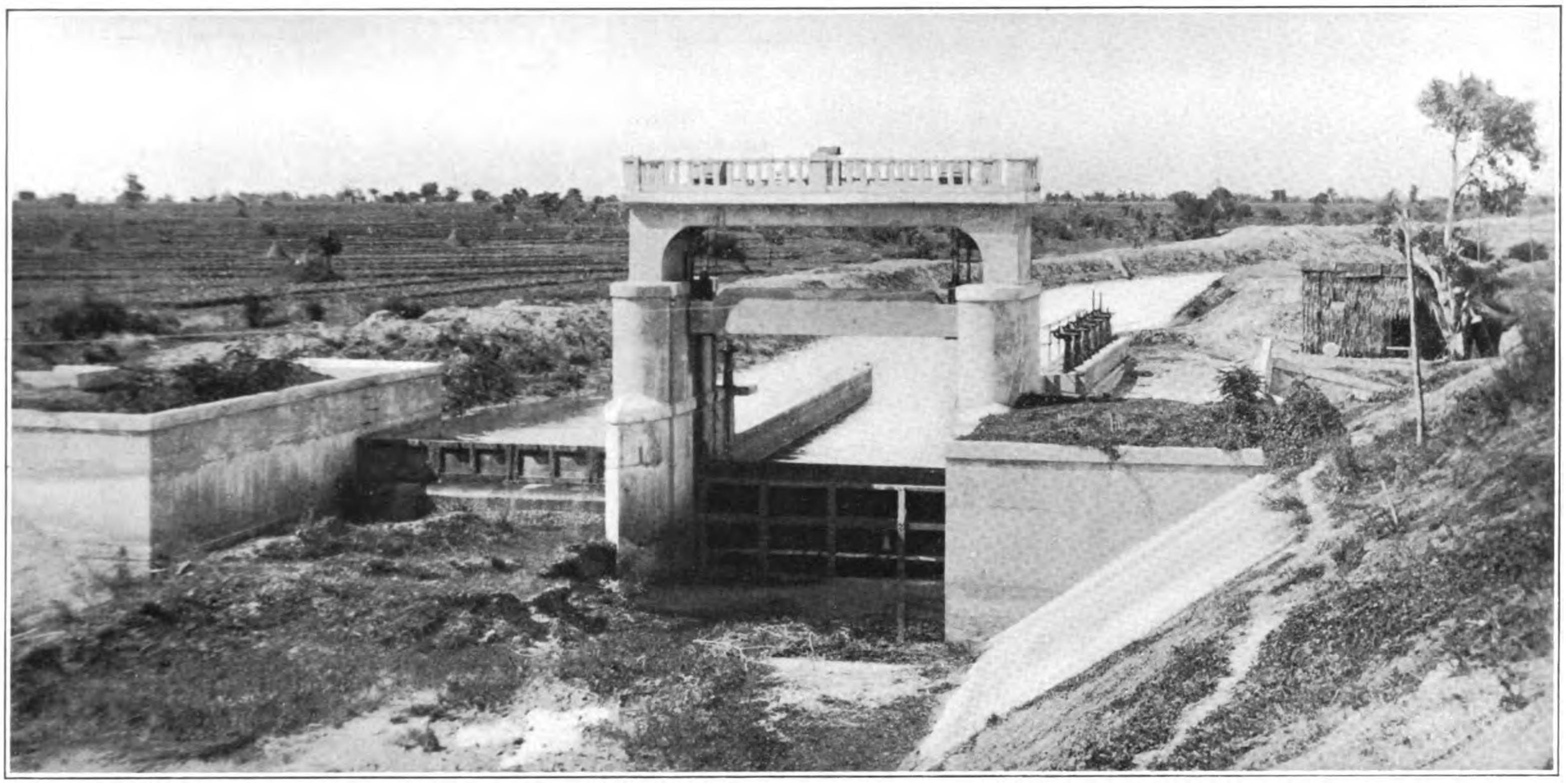
Province	Location	Type	Remarks
Albay	Legaspi	Normal School	Completed by contract.
Do	Tabaco	Presidencia	Plans and contract.
Antique	San Jose	Provincial Hospital	Plans, specifications and estimate.
Do	do	Capitol Building	Plans under preparation.
Bataan	Talisay	Bridge	Plans and specifications.
Bulacan	Malolos	Capitol Building	Plans, specifications, and estimate.
Capiz	Calivo	Provincial Hospital	Plans and contract.
Cebu	Cebu	Trade School	Plans and contract.
Do	do	Extension of Southern Island Hospital.	Plans under preparation.
Davao	Davao	Addition to Davao Presidencia.	Plans, specifications, and estimate.
Iloilo	Cabatuan	Addition to Presidencia.	Plans under preparation.
Ilocos Sur	Vigan	Provincial High School.	Conduit work completed by contract.
Do	do	Provincial Capitol	Plans and contract.
Laguna	Santa Cruz	Provincial Hospital, Stage IV.	Plans and contract.
Lanao	Iligan	Pier lights	Plans furnished.
Leyte	Tacloban	High School	Conduit work completed by contract.
Manila	Manila	Contagious Pavilion, San Lazaro Hospital.	Wiring completed by contract.
Do	do	Post-office building	Conduit work being done by contract.
Do	do	Post-office garage	Plans ready.
Do	do	Post-office machine and carpentry shop.	Plans ready.
Do	do	Library, University of the Philippines.	Plans and contract.
Do	do	Pandacan Research Laboratory.	Completed by contract.
Do	do	Bureau of Forestry Annex.	Completed by contract.
Do	do	Addition to Dispensary, Philippine General Hospital.	Completed by contract.
Do	do	Human Body Crematory, San Lazaro Hospital.	Plans, specifications, and estimate.
Do	do	Rear Wing, Rizal Hall.	Plans and contract.

TABLE C.—WIRING OF BUILDINGS, PARKS, FOUNTAINS, BRIDGES, WHARVES—Continued

Province	Location	Type	Remarks
Manila	Manila	Luneta Comfort Station.	Plans under preparation.
Do	do	Bureau of Science Laboratory.	Ready to award contract.
Do	do	Manila West High School.	Plans under preparation.
Do	do	New Luneta Band Stand.	Plans under preparation.
Do	do	Jones Bridge—lights.	Plans and specifications.
Mountain Province	Baguio	Governor General's Residence.	Plans under preparation.
Nueva Ecija	Cabanatuan	Presidencia	Completed by contract.
Do	do	Park lighting	Contract awarded.
Do	do	Provincial Hospital, administrative building, kitchen and ward pavilion.	Plans, specifications, and estimate.
Do	do		
Do	do		
Do	do	Court House and Jail.	Plans, specifications, and estimate.
Do	Muñoz	Hospital Central Luzon Agricultural School.	Plans under preparation.
Occidental Negros	Bacolod	Provincial capitol	Being done by contract.
Do	do	Provincial Hospital private ward.	Completed by contract.
Oriental Negros	Dumaguete	Proposed addition to provincial capitol.	Plans under preparation.
Pampanga	San Fernando	Provincial High School.	
		Provincial hospital	Ready to award contract.
Do	do	High school assembly Hall.	Being done by contract.
Pangasinan	Lingayen		Being done by contract.
Do	do	Court house	Plans under preparation.
Rizal	Pasig	Provincial capitol addition.	Plans prepared.
Do	San Felipe Neri	Insular asylum garage.	Plans and contract.
Do	do	Insular asylum chronic building.	Plans and contract.
Do	do	Insular asylum doctor's Quarters Type A.	Plans and contract.
Do	do	Insular asylum doctor's Quarters Type B.	Plans and contract.
Do	do	Therapy cottages	Plans under preparation.
Sorsogon	Sorsogon	Provincial hospital	Being done by contract.
Tarlac	Concepcion	Presidencia	Plans and specifications.
Tayabas	Lucena	Governor's residence.	Plans under preparation.
Do	do	Provincial hospital addition to kitchen.	Estimate.
Do	Mauban	Presidencia and market.	Plans and contract.
Zamboanga	Dapitan	Rizal Memorial Hospital.	Plans specifications, and estimate.
		Standard school building plan No. 9.	Plans.
Do	Pasonangka	Social hall and band stand.	Plans and specifications.

TABLE D.—OIL ENGINE DRIVEN ELECTRIC PLANTS

Province	Location	Type	Remarks
Abra	Lagangilang	Agricultural school electric lighting system.	Plans and estimate.
Batangas	Taal	Electric and pumping plant, third general unit.	Advertised for bids.
Do	do	Repair parts for engine.	Technical aid given.
Do	Bauan	Adjustment of engine	Technical aid given.
Capiz	Calibo	Hospital lighting and water supply.	Bids under study.
Cebu	Argao	Light and power plant.	Settlement of contract.
Manila	Trade School	Power Plant, second unit.	Contract awarded.
Marinduque	Santa Cruz	Light and power plant.	Repairs made, put plant into operation.
Occidental Negros	Isabela	Light and power plant.	Plans and specifications.
Nueva Ecija	Cabanatuan	Government center plant.	Estimates and plans prepared.
Do	Agricultural School, Muñoz.	Electric lighting system extension.	Design and plans for additions.
Pampanga	Magalang	Agricultural school lighting plant.	Contract awaiting approval.
Pangasinan	Lingayen	Provincial electric lighting plant.	Selection of Chief Electrician.
Do	Dagupan Hospital	Repairs of plant	By administration.
Samar	Catbalogan	Fifty horse power general unit.	Inspection and tests for acceptance.
Tayabas	Mauban	Additions to lighting system.	Plans and contract.



COMBINED WASTEWAY AND HEADGATE, PEÑARANDA IRRIGATION SYSTEM, NUEVA ECIJA PROVINCE

TABLE E.—HYDROELECTRIC PLANTS

Province	Location	Type	Remarks
Laguna	Los Baños	Quarry hydro-electric plant.	Contracts and measurements for sale of extra power.
Do.	Botocan Falls	Manila Electric Co. Plant.	Preliminary inspection.
Do.	Nagcarlan	Philippine Power and Development Co. Plant.	Inspection.
Mountain Province	Baguio	Two hundred horse power engine auxiliary.	Inspection and tests for acceptance.
Do.	Agno River	North Luzon Power Co. Plant.	Preliminary inspection.
Zamboanga	Zamboanga	One hundred fifty horse power oil engine auxiliary.	Inspection and tests for acceptance.
Do.	do.	Extension of system.	Bill of materials.

TABLE F.—PUMPING PLANTS

Province	Location	Type	Remarks
Batangas	Batangas	Second pumping unit, electric drive.	Completed, tested for acceptance.
Bulacan	Bulacan	Waterworks plant, electric drive.	Contract. Near completion.
Do.	Hagonoy	do.	Do.
Do.	Malolos	Waterworks pump, oil engine drive.	New pump specified.
Do.	Meycawayan	Waterworks Plant, electric drive.	Contract. Near completion.
Do.	San Miguel	Second pumping unit, oil engine drive.	Plans and specifications. Advertised.
Do.	do.	Fire pump set.	Do.
Cavite	Mendez-Nuñez	Waterworks plant, water wheel drive.	Inspection and repair.
Cebu	Cebu Leprosarium Mandawe.	Waterworks plant	Specifications and bill of materials.
Laguna	Calamba	Second unit, electric drive.	Plans and specifications. Contract awarded.
Do.	Pagsanjan	Second unit, oil engine drive.	Plans and specifications. Bids received.
Manila	San Lazaro Hospital.	Deep well pump, electric drive.	Inspection. Settlement.
Marinduque	Calapan	Repairs to engine	Assistance given.
Nueva Ecija	Cabanatuan	Pumping plant extension.	Study and estimate.
Occidental Negros	Silay	Waterworks	Plans and specifications. Bids received.
Oriental Negros	Dumaguete	Second pumping unit.	Study and estimate.
Palawan	Culion	Waterworks extension and improvement.	Installed by administration.
Pampanga	San Fernando	Waterworks plant	Contracts award. Near completion.
Do.	Guagua	do.	Do.

TABLE F.—PUMPING PLANTS—Continued

Province	Location	Type	Remarks
Rizal	Antipolo	First oil engine driven deep well pump.	Completed by administration.
Do.	do.	Second oil engine driven deep well pump.	Specifications and bill of materials.
Do.	Welfareville	Deep well pump	Purchased and installed.
Do.	do.	Booster pump	Do.
Do.	San Felipe Neri	Asylum water supply second unit.	Do.

TABLE G.—CALYX DRILLS

Province	Location	Name of project	Remarks
Albay	Legaspi	Legaspi Port development.	Borings completed.
Bataan	Bataan–Pampanga Road.	Balasic River Bridge.	Do.
Do.	Orion South Road	San Vicente River Bridge.	Do.
Do.	Balanga South Road.	Talisay River Bridge.	Do.
Benguet	Benguet–Pangasinan Boundary.	Dungon River Bridge	Do.
Cagayan	Tuguegarao–Alcala Road.	Babogan River Bridge.	Do.
Do.	Cagayan Valley Road	Pared River Bridge.	Borings being taken.
Camarines Norte	Daet–Basud Road	Daet (McKinley) Bridge.	Do.
Capiz	Dao-Cuartero Road.	Panay River Bridge.	Do.
Cebu	Consolacion River	Consolacion River Bridge.	Do.
Do.	Davao River	Davao River Bridge.	Do.
Do.	Catmon–Daan River	Catmon-Daan River Bridge.	Do.
Do.	Naghalin River	Naghalin River Bridge.	Do.
Ilocos Norte	Laoag–Bacarra Road	Bacarra River Bridge.	Do.
Do.	Badoc–Apatot Road.	Badoc River Bridge.	Borings completed.
Do.	Salomague	Salomague Port	Boring work completed.
Ilocos Sur	Abra River	Abra Gap Bridge	Borings completed.
Do.	Tagudin–Cervantes Road.	Ursadan River Bridge.	Do.
Iloilo	Passi-Calinog Road.	Lamonan River Bridge.	Do.
Do.	Iloilo South Road	Tigbauan River Bridge.	Do.
Isabela	Santiago–Echague Road.	Ipil River Bridge	Borings being taken.
La Union	Amburayan River	Amburayan River Bridge.	Borings completed.
Manila	Pasig River	Colgante Bridge	Do.
Do.	Pier No. 5	Approach to Pier No. 5.	Do.
Pampanga	Manila–Tarlac Road.	Sapang-Balen Bridge	Do.
Pangasinan	Lingayen–Alaminos Road.	Paitan River Bridge.	Do.
Do.	Balincagin–Burgos Road.	Tambacan River Bridge.	Borings being taken.

Concrete Cribbing at End of Coral Rock Approach to the Dumaguete Pier, Oriental Negros

TABLE H.—CEMENT GUN AND SAND BLAST

Province	Name of project	Nature of work	Remarks
Cebu	Cebu marginal wharf	Repairs	Work still in progress.
Do.	3 bridges	do.	Work completed.
Iloilo	Iloilo marginal wharf	Repairs of concrete piles.	Work partially completed.
Manila	Piers 3 and 5	Repairs	Work still in progress.
Do.	Post office	do.	Do.
Occidental Negros	Banawang Bridge	do.	Work completed.
Do.	Binicuil Bridge	do.	Do.
Do.	Marayo Bridge	do.	Do.
Do.	Pulupandan Pier	do.	Do.
Do.	Talaban-Diot Bridge	do.	Do.

TABLE I.—MISCELLANEOUS MECHANICAL-ELECTRICAL

Province	Location	Type	Remarks
Batanes	Basco	Municipal lighting from radio station.	Recommendation and estimate.
Camarines Sur	Naga	Underground telephone cable.	Study and recommendation.
Ilocos Sur	Abra River	Motor driven ferry	Assisted in repairs.
Laguna	Calauang	Motor boat engine	Advice and recommendation.
La Union	San Fernando	Trade school engine	Installed by contract.
Manila	Manila	Electric fans for City Hall.	Comparative tests and recommendation.
Do.	Bureau of Labor	Telephone system	Installed by contract.
Do.	Bureau of Public Works.	Electrical section instruments.	Submitted list of recommended instruments.
Do.	Post Office	Elevators	Design of hatchways.
Do.	Pandacan	Operating tables	Settlement of contract.
Do.	U. P. library	Elevator	Design of hatchway.
Mountain Province	Baguio	Quarry	Specifications for motor.
Palawan	Isabela	Motor boat engine	Advice on selection.
Pampanga	Arayat	Quarry	Transfer of rock crusher and engine from Los Baños.
Rizal	Asylum kitchen	Steam cooking and hot water system.	Plans and Bill of Materials.
Do.	Asylum	Garbage incinerator	Plans and specifications. Advertised for bids.
Tayabas	Sariaya	Electric plant	Furnished specifications for street light fixtures.

TABLE J.—INVESTIGATIONS AND REPORTS

Province	Location	Nature of work	Remarks
Agusan	Butuan	R. C. pile and wood extension.	Plans prepared.
Albay	Legaspi	Port improvement	Core borings made and plans started.
Capiz	Calaan	Permanent quarry plant.	Inspection of site; plans started.
Cotabato	Parang	Port improvement	Survey and study.
Do.	Glan	Port improvement	Do.
Davao	Pakiputan Straits	Port development	Do.
Ilocos Sur	San Ildefonso	Port improvement	Study.
Do.	San Esteban	do.	Survey and preliminary study.
Insular	General	Form of contract for use of power at canal chutes.	Draft. Correspondence with prospective users.
Do.	do.	Board of examiners, electrical engineers.	Furnished one member.
Do.	General	Various franchises	Technical advice given.
Do.	do.	Crude oil engine road rollers.	Investigations for acceptance.
Insular	General	Standardization of motor vehicles.	Furnished full membership, Board of Engineers advisory to Standardization Committee.
La Union	San Fernando	Breakwaters	Study.
Manila	City Government	Garbage incinerator	Furnished one member of Advisory Committee.
Misamis	Jimenez	Port development	Survey and preliminary study.
Occidental Negros	Various	Quarry plants	Inspection of various locations. Plans started for Bago River.
Palawan	Culion	Regulation of rates for the public utilities.	Technical advice to Department Secretary. Preparation of correspondence.
Tayabas	Baler	Port improvement	Survey and study completed.
Do.	Mauban	do.	Plans for boat and launch landing completed.
Do.	Laguimanoc	do.	Survey and study completed.
Zamboanga	Dapitan	do.	Survey and study of Palunan Point completed.

DIVISION OF ARCHITECTURE

JUAN M. ARELLANO, *Acting Consulting Architect*

There were nearly four hundred projects submitted to this Office during the year for study and the preparation of necessary drawings. Some of the larger projects, including Insular Buildings and Provincial Capitols, required considerable time for study and proper solution and emphasized the necessity for additional technical personnel in order that the Division may handle the increasing number of problems presented to it in an expeditious manner.

With the passage of Act No. 3482, governing the preparation of development plans for cities and towns, more attention has been devoted to the study of town planning problems in relation to the location of civic centers and proposed public buildings. The practice now followed in the preparation of site plans for public buildings requires that a study be made of the proposed site with reference to the future development and needs of the town, and, in most cases, a town plan is prepared to make provision for the present and future development of the locality where the new building is to be built. This new policy has encouraged municipal officials to take more interest in town planning, especially in the development of plazas, and, as a result, there is a large number of requests for plans for such work pending action. Additional personnel is needed for handling this work, as well as for most of the other activities of this Division.

The following tabulation shows the status of work on all projects submitted to the Division for study and the preparation of plans.

MANILA PROJECTS

Name of projects	Character	Status
BANDSTAND		
1. Luneta Bandstand	Preliminary drawing	Completed.
PUBLIC BUILDINGS		
2. Post Office Building	Working drawing	Do.
3. Property Division Building, P. O.	do.	Under preparation.
4. Garage Building, Post Office	do.	Do.
5. Proposed Immigration Detention Building, Bureau of Customs.	Preliminary drawing	Do.
6. Proposed Metropolitan Water District Building.	do.	Completed.
7. Proposed Register of Deeds Vault, City of Manila.	Working Drawing	Do.
8. Additions and alterations to Malacañang Palace.	do.	Under preparation.
9. Museum, Port Area	Preliminary drawing	Completed.
10. Bureau of Science Laboratory	Working drawing	Do.
11. Armchairs, Council of State	do.	Do.
12. Plant Inspection Building, Bureau of Agriculture.	do.	Do.
COMFORT STATIONS		
13. Luneta Comfort Station	Working drawing	Do.

MANILA PROJECTS—Continued

Name of projects	Character	Status
HOSPITALS		
14. Proposed Hospital and Dispensary, U. P.	Preliminary drawing	Completed.
15. Proposed X-Ray Laboratory, P. G. H.	do	Do.
16. Addition to Dispensary, P. G. H	Working drawing	Do.
17. Human Body Crematory, San Lazaro Hospital.	do	Do.
SCHOOL BUILDINGS		
18. Tondo Intermediate School	Preliminary drawing	Completed.
19. Manila West High School	Working drawing	Do.
20. Soler Elementary School	Preliminary drawing	Do.
21. College of Engineering Building, University of the Philippines.	Working drawing	Do.
22. Proposed auditorium, U. P	Preliminary drawing	Under preparation.
23. President's office, U. P.	Working drawing	Completed.
24. Rear Wing, Rizal Hall, U. P	do	Do.
25. Library, U. P.	do	Do.

Emergency Hospital, Malaybalay, Bukidnon Province

PROVINCIAL PROJECTS

Name of projects	Character	Status
BANDSTANDS		
1. Proposed bandstand, Bayambang, Pangasinan.	Preliminary drawing	Completed.
2. Cabanatuan Bandstand, Nueva Ecija.	Bacolod bandstand type	Do.
3. Proposed bandstand, Pasonanka, Zamboanga.	Working drawings	Do.
4. Bani Bandstand, Pangasinan	do	Do.
BARRACKS		
5. Officers' Quarters, Philippine Constabulary, Tagbilaran, Bohol.	Working drawings	Do.
PUBLIC BUILDINGS		
6. Proposed cargo shed, Cebu	Working drawing	Do.
7. Proposed office and storeroom, Lucena, Tayabas.	Preliminary drawing	Do.
8. Proposed courthouse and jail, Davao.	do	Do.
9. Proposed cottage government employees, Lucena, Tayabas.	do	Do.
10. Proposed governor's residence, Lucena.	Working drawings	Do.
11. Proposed completion of Iloilo custom house, Iloilo.	do	Do.
12. Proposed register of deeds vault, Baguio.	do	Do.
13. Alteration and addition to Mansion House, Baguio.	do	Do.
CAPITOLS		
14. Proposed Bukidnon Capitol, Malaybalay.	Preliminary drawing	Do.
15. Proposed Samar Capitol, Catbalogan.		Pending.
16. Proposed addition to Tarlac Provincial Building.	Preliminary drawing	Completed.
17. Proposed Cebu capitol	Working drawings	Under preparation.
18. Proposed addition to Pasig capitol	do	Do.
19. Proposed addition to Cabanatuan capitol, Nueva Ecija.	do	Do.
20. Proposed Vigan capitol, Ilocos Sur	do	Completed.
21. Proposed Malolos capitol, Bulacan	do	Under preparation.
22. Proposed Antique capitol building	do	Completed.
23. Proposed addition to Oriental Negros Capitol, Dumaguete.	do	Do.
24. Proposed addition to Capiz Provincial building.	do	Do.
CARENDERIA		
25. Proposed carenderia, Batangas	Preliminary drawing	Do.
HOSPITALS		
26. Male Chronic Building, San Felipe Neri, Insular Asylum, Rizal.	Working drawings	Do.
27. Doctor's Quarters, Insular Asylum	do	Do.
28. Garage and Servant's Quarters, Insular Asylum.	do	Do.
29. Proposed infirmary building, Insular Asylum.	do	Under preparation.
30. Occupational Therapy, Insular Asylum.	do	Completed.
31. Flag pole, Insular Asylum	do	Do.
32. Addition to kitchen, Insular Asylum	do	Do.
33. Proposed pump station, Welfareville, San Felipe Neri, Rizal.	Working drawings	Do.
34. Proposed administration building, Welfareville.	do	Do.
35. Proposed dormitory building, Welfareville.	do	Do.
36. Proposed general hospital, Welfareville.	do	Do.
37. Proposed kitchen, General Hospital, Zamboanga.	do	Do.
HOSPITALS—continued		
38. Proposed maternity hospital, Cebu	Working drawings	Under preparation.
39. Proposed nurses home, Dagupan	do	Completed.
40. Proposed Cabanatuan hospital, Nueva Ecija.	Standard	Do.
41. Proposed San Fernando hospital, Pampanga.	do	Do.
42. Proposed Southern Islands Hospital, Cebu.	Working drawings	Do.
43. Proposed Muños hospital, Nueva Ecija.	do	Do.
44. Proposed contagious hospital, Cebu	do	Under preparation.
45. Proposed Calivo hospital, Capiz	Standard plan	Completed.
46. Proposed Rizal Memorial Hospital, Dipolog, Zamboanga.	do	Do.
47. Proposed Davao hospital	Working drawings	Do.
48. Proposed Santa Cruz hospital, Laguna.	Standard plan	Do.
BICOL LEPER COLONY		
49. Infirmary	Philippine Health Service drawings.	Do.
50. Kitchen	do	Do.
51. Mess hall	do	Do.
52. Barracks	do	Do.
53. Treatment center	do	Do.
54. Treatment Center, Zamboanga Leper Colony.	do	Do.
MARKETS AND TIENDAS		
55. Proposed market and tiendas, Sinait, Ilocos Sur.	Standard plan	Do.
56. Proposed market and tiendas, San Luis, Pampanga.	Standard plan	Do.
57. Proposed two-story bath, toilet, Naga, Camarines Sur.	Preliminary drawings	Do.
58. Pasig, Market, Rizal	Standard plan	Do.
59. Oton, Market, Iloilo	do	Do.
60. San Dionisio Market, Iloilo	do	Do.
61. San Quintin Market, Pangasinan	do	Do.
62. San Nicolas Market, Pangasinan	do	Do.
63. Inabanga Market, Bohol	do	Do.
64. Salimbao Market, Cotabato	do	Do.
65. Talibon Market, Bohol	do	Do.
66. Jagna Market, Bohol	do	Do.
67. Dipolog, Market, Zamboanga	do	Do.
68. Balasan Market, Iloilo	do	Do.
69. Pavia Market, Iloilo	do	Do.
70. Bongabong Market, Nueva Ecija	do	Do.
71. Santa Rosa Market, Nueva Ecija	do	Do.
72. San Juan Market, Rizal	do	Do.
73. Sierra Bullones Market, Bohol	do	Do.
74. Entrance Arcade, Laoag, Ilocos Norte.	Preliminary drawing	Do.
75. Santa Rosa Market, Laguna	Standard plan	Do.
76. Bangar Market, La Union	do	Do.
77. Mangatarem Market, Pangasinan	do	Do.
78. Tejero Market, Cebu	do	Do.
79. Iloilo Market, Iloilo	do	Do.
80. Lemery Market, Batangas	do	Do.
MONUMENTS AND FOUNTAINS		
81. Proposed Base, Rizal Monument, Santa Cruz, Davao.	Working drawings	Under preparation.
82. Proposed fountain, Loay, Bohol	No action	Pending.
83. Proposed Rizal monument, Solano, Nueva Vizcaya.	Preliminary drawing	Completed.
84. Proposed Rizal monument, Paniqui, Tarlac.	do	Do.
85. Proposed Rizal and Bonifacio monument, Camalig, Albay,	do	Do.
86. Proposed Rizal Monument, Mountain Province.	do	Do.
87. Rizal Monument, Ilagan, Isabela	Working drawings	Do.

Nurses Home, Tarlac Provincial Hospital

PROVINCIAL PROJECTS—Continued

Name of projects	Character	Status
MONUMENTS AND FOUNTAINS—continued		
88. Proposed General A. Luna Fountain, Badoc, Ilocos Norte.	Preliminary drawing.....	Completed.
89. Proposed Pergola, Pasonanka, Zamboanga.	Working drawings.......	Do.
90. Proposed boundary sign, Tayabas Batangas.	Preliminary drawing.....	Do.
PRESIDENCIA		
91. Addition to Tuguegarao presidencia, Cagayan.	Preliminary drawing.....	Do.
92. Reconstruction Santa Cruz presidencia, Ilocos Sur.	Working drawings.......	Do.
93. Proposed San Juan presidencia, La Union.	Plan by District Engineer	Do.
94. Proposed Tanauan presidencia, Batangas.	Preliminary drawing.....	Do.
95. Proposed Banna presidencia, Ilocos Norte.	Standard plan...........	Do.
96. Proposed addition to Badajoz presidencia, Romblon.	Preliminary drawing.....	Do.
97. Proposed addition to Davao municipal building.	Working drawings.....	Do.
98. Proposed toilet, Solano Presidencia, Nueva Vizcaya.	Working drawings.......	Do.
99. Proposed Danao presidencia, Cebu...	....do.................	Do.
100. Proposed Solano presidencia, Nueva Vizcaya.	Clarin type.............	Do.
101. Proposed Silang presidencia, Cavite..	Compostela type........	Do.
102. Proposed Looc presidencia, Romblon.	....do.................	Do.
103. Proposed Concepcion presidencia, Tarlac.	Davao type.............	Do.
104. Proposed Jagna presidencia, Bohol...	Standard plan...........	Do.
105. Proposed Sagnay presidencia, Camarines Sur.	District Engineer's plan..	Do.
106. Proposed addition to Cabatuan presidencia, Iloilo.	Working drawings.......	Do.
107. Proposed Batac presidencia, Ilocos Norte.	Magalang type..........	Do.
108. Proposed Solana presidencia, Cagayan.	San Jose type...........	Do.
109. Proposed addition to Lemery presidencia, Batangas.	Working drawings.......	Do.
110. Proposed Sariaya presidencia, Tayabas.	.....do.................	Under preparation.
111. Proposed Iloilo municipal building...	Preliminary drawings....	Completed.
112. Proposed addition to Maasin presidencia, Iloilo.	Working drawings.......	Do.
113. Proposed Sibalom presidencia, Antique.	Magalang type..........	Do.
114. Proposed Calapan presidencia, Mindoro.	San Jose type...........	Do.
115. Proposed Batuan presidencia, Bohol.	Clarin type.............	Do.
SCHOOL BUILDINGS		
116. Reconstruction Roof Truss, Panitan, Capiz.	Working drawings.......	Do.
117. Prop. Plan No. 9, Standard..........	.....do.................	Do.
118. Proposed domestic science, Tarlac...	.....do.................	Do.
119. Proposed addition to Lauaan, Antique.	Preliminary drawings....	Do.
120. Proposed addition to Cabugao, Ilocos Sur.	Working drawings.......	Do.
121. Proposed Mess Hall, Lumbatan Agricultural School, Lanao.	.....do.................	Do.

PROVINCIAL PROJECTS—Continued

Name of projects	Character	Status
SCHOOL BUILDINGS—continued		
122. Proposed Muñoz agricultural school, Nueva Ecija.	No action..............	Pending.
123. Proposed Malolos trade school, Bulacan.	.....do.................	Do.
124. Proposed Batangas high school......	Preliminary drawings....	Completed.
125. Proposed Cebu trade school.........	Working drawings.......	Do.
126. Proposed Tacloban high school (standard).	Pasig type..............	Do.
127. Proposed San Fernando high school, Pampanga.	Working drawings.......	Do.
128. Proposed Vigan high school, Ilocos Sur.	Pasig type..............	Do.
129. Proposed Pangasinan assembly hall..	Working drawings.......	Do.
130. Proposed Bacolod high school, Occidental Negros.	.....do.................	Do.
SOCIAL HALLS		
131. Proposed social hall, Pasonanka.....	Working drawings.......	Do.
132. Proposed community hall, Capiz....	.....do.................	Under preparation.
TABLETS		
133. Bronze tablet, provincial building, Cotabato.	Working drawings.......	Completed.
134. Bronze tablet, Manchela Bridge, Occidental Negros.	.....do.................	Do.
135. Bronze tablet, Oton, market, Iloilo..	.....do.................	Do.
136. Bronze tablet, Cabanatuan, Nueva Ecija.	.....do.................	Do.
137. Bronze tablet, San Miguel Waterworks, Bulacan................	.....do................. .....do.................	Do. Do.
138. Bronze tablet, Cotabato, Rizal Park.	.....do.................	Do.
139. Bronze tablet, Rancho Bridge, Batangas.	.....do.................	Do.
140. Bronze tablet, Hagonoy Bridge, Batangas.	.....do.................	Do.
141. Bronze tablet, Lagnas Bridge, Batangas.	.....do.................	Do.
142. Bronze tablet, Hagonoy Waterworks, Bulacan.	.....do.................	Do.
143. Bronze tablet, Tabaco Presidencia, Albay.	.....do.................	Do.
144. Bronze tablet, Lopez Brothers, Bridge, Occidental Negros.	.....do.................	Do.
145. Bronze tablet, Binalbagan presidencia, Occidental Negros.	.....do.................	Do.

DEVELOPMENT PLANS

MANILA PROJECTS

1. City of Manila and satellite towns...	Plan....................	Finished.
2. Proposed Development Dasmariñas Street Extension showing alterations on blocks Nos. 2121 and 2123.	.....do.................	Do.
3. Proposed improvement street layout section, Santa Cruz District.	.....do.................	Do.
4. Proposed improvement Magallanes Monument.	.....do.................	Do.
5. Proposed Dewey Boulevard.........	Development plan......	Do.
6. Road to Cementerio del Norte for two-way traffic (entrance).	.....do.................	Fifty per cent finished.
7. Study of circular and radial roads for greater Manila.	.....do.................	Finished.

PROVINCIAL PROJECTS

8. Zamboanga Leper Treatment Station	Location plan...........	Finished.
9. Proposed treatment center, Bicol Leper Station, Albay.	.....do.................	Do.
10. Rizal Memorial Hospital, Dapitan, Zamboanga.	.....do.................	Do.
11. Doctors' and Nurses' Quarters, Bukidnon Hospital, Malaybalay.	.....do.................	Do.
12. Proposed site and arch, Santa Rosa Bridge, Santa Rosa, Laguna.	.....do.................	Do.
13. Proposed government center, Malaybalay, Bukidnon.	.....do.................	Do.
14. Proposed development plan, Bayambang, Plaza, Pangasinan.	Development plan.......	Do.
15. Proposed Rizal monument, Ilagan, Isabela.	Location plan...........	Do.
16. Proposed development plan, Asingan Plaza, Pangasinan.	.....do.................	Do.
17. Tigbauan Park, Tigbauan, Iloilo.....	Development plan.......	Do.
18. Proposed improvement high school road, San Fernando, Pampanga.	.....do.................	Do.
19. Proposed Magdalena Park, Laguna..	.....do.................	Ninety per cent finished.
20. Development plan, Tuguegarao, Cagayan.	Preliminary plan........	Finished.
21. Proposed development plan, City of Iloilo and vicinity.	Development plan.......	Do.
22. Plan showing arcades, overhangs, and cross-sections streets, Baguio.	.....do.................	Do.

PROVINCIAL PROJECTS—Continued

Name of projects	Character	Status
23. Proposed development Cabugao, Apayao, Mountain Province.	Preliminary plan	Finished.
24. Iloilo Market, Iloilo	Location plan	Do.
25. Tejero Market, Cebu	do.	Do.
26. Proposed market building, Mangatarem, Pangasinan.	do.	Do.
27. Proposed market building and tiendas, Bangar, La Union.	do.	Do.
28. Proposed market building, Santa Rosa, Laguna.	do.	Do.
29. Revised location, Sierra Bullones Market, Bohol.	do.	Do.
30. Market building and tiendas, Dipolog, Zamboanga.	Location plan, 21 meters, Type A.	Do.
31. Proposed market and tiendas, Jagna, Bohol.	Location plan	Do.
32. Proposed market and tiendas, Talibon, Bohol.	Location plan, 21 meters, Type A.	Do.
33. Public market, school site and surrounding, San Juan, Rizal.	Development plan	Under study.
34. Proposed market and tiendas, Salimbao, Cotabato.	Location plan	Finished.
35. Proposed market and tiendas, Inabanga, Bohol.	do.	Do.
36. Proposed market and tiendas, San Nicolas, Pangasinan.	do.	Do.
37. Proposed market and tiendas, San Quintin, Pangasinan.	Location plan, 21 meters, Type A.	Do.
38. Proposed market and tiendas, San Dionisio, Iloilo.	Location plan, 12 meters, Standard type.	Do.
39. Proposed market and tiendas, Oton, Iloilo.	Location plan, 21 meters, Type A.	Do.
40. Proposed market building and tiendas, Pasig, Rizal.	Location plan	Do.
41. Batuan Presidencia, Bohol	do.	Do.
42. Proposed Calapan presidencia, Mindoro.	do.	Ninety-five per cent finished.
43. Proposed Iloilo municipal building, Iloilo.	do.	Finished.
44. Proposed Solana presidencia, Cagayan.	do.	Do.
45. Proposed Batac presidencia, Ilocos Norte.	do.	Do.
46. Provincial Capitol Building, Malolos, Bulacan.	do.	Do.
47. Proposed Jagna presidencia, Bohol	do.	Do.
48. Concepcion Presidencia, Tarlac	do.	Do.
49. Silang Presidencia, Cavite	do.	Ninety per cent finished.
50. Proposed Danao presidencia, Cebu	do.	Finished.
51. Proposed development plan, Batangas High and Trade School Buildings.	do.	Do.
52. Malolos Trade School, Bulacan	do.	Do.
53. Proposed development plan, intersection, Laguna–Batangas Road, Calamba, Laguna.	Development plan	Do.
54. Proposed development plan, municipality of Bulan, Sorsogon.	do.	Do.
55. Location for proposed arch, Santa Rosa, Laguna.	Location plan	Do.
56. Development plan, proposed leprosarium, Zamboanga, Zamboanga.	Development plan	Ninety-five per cent finished.
57. Proposed development plan, Laoag Plaza, Ilocos Norte.	do.	Ninety per cent finished.
58. Proposed development plan and profile, mansion-house grounds and Wright park, Baguio.	Plan—development	Finished.
59. Proposed study street planning and approach Ayala Bridge.	Plan	Do.
60. Proposed development plan, Tarlac Provincial Hospital.	Location plan	Seventy-five per cent finished.
61. Quezon National Forest Park, Tayabas, between Pagbilao and Atimonan.	Development plan	Under preparation.
62. Passi Plaza, Iloilo	do.	Under study.
63. San Dionisio Plaza, Iloilo	do.	Finished.
64. Proposed park of Leon, Iloilo	do.	Under study.
65. Proposed town public square, La Paz, Tarlac.	do.	Finished.
66. Proposed improvements, Lucena and Zarraga Plaza, Santa Barbara, Iloilo.	do.	Under study.
67. Proposed improvement provincial grounds, Bayombong, Nueva Vizcaya.	do.	Do.
68. Proposed monument, Dr. Rizal, Solano, Nueva Vizcaya.	Location plan	Do.
69. Proposed fountain, Loay, Bohol	Plan	Do.
70. Proposed improvement plaza, Sara, Iloilo.	Development plan	Do.
71. Proposed monument, M. H. del Pilar, Bustos, Bulacan.	Location plan	Fifty per cent finished.
72. Proposed park, Clarin, Misamis	Development plan	Under study.
73. Proposed improvement, Santa Cruz, Plaza, Zambales.	Plan	Do.
74. Extension Javellana–Ledesma Street, Jaro, Iloilo.	do.	Do.
75. Proposed Amulong presidencia, Cagayan.	Location plan	Do.
76. Proposed market site, Bongabon, Nueva Ecija.	do.	Do.
77. Proposed Sogod presidencia, Cebu	do.	Do.
78. Proposed Solsona presidencia, Ilocos Norte.	do.	Do.

Baguio–Santo Tomas Road, Benguet Province

PROVINCIAL PROJECTS—Continued

Name of project	Character	Status
79. Proposed market, Badian, Cebu	Location plan	Under study.
80. Proposed market, Pavia, Iloilo	do.	Do.
80a. Proposed Carles town improvements, Iloilo.	Development plan	Do.
81. Proposed San Luis market, Pampanga.	Location plan	Do.
82. Proposed provincial capitol, Catbalogan, Samar.	do.	Do.
83. Proposed Bukidnon capitol, Malaybalay.	Development plan	Ninety per cent finished.
84. Proposed Romblon capitol and town plan.	do.	Under study.
85. Proposed Pasuquin plaza, Ilocos Norte.	do.	Do.
86. Proposed base, Rizal Monument, Santa Cruz, Davao.	Location plan.	Finished.
87. General plan, improvement and future development, Romblon, Romblon.	Development plan.	Under study.
88. Proposed market and tiendas, Sinait, Ilocos Sur.	Location plan.	
89. Proposed market building, Tubao, La Union.	do.	Do.
90. Provincial Capitol, Pasig Rizal	do.	Do.
91. Market Building, Bayambang, Pangasinan.	do.	Finished.
92. Provincial Building, Malolos, Bulacan.	do.	Do.
93. Market Building, San Jose, Nueva Ecija.	do.	Under study.
94. Market Building, Orion, Bataan	do.	Do.
95. Market Building, Naga, Camarines Sur.	do.	Finished.
96. Market Building, San Dionisio, Iloilo.	do.	Do.
97. Aparri Presidencia, Cagayan	do.	Do.
98. Banna Presidencia, Ilocos Norte	do.	Under study.
99. Pinili Presidencia, Ilocos Sur	do.	Fifty per cent finished.
100. Masantol Presidencia, Pampanga	do.	Finished.
101. Bigaa Presidencia, Bulacan	do.	Under study.
102. Calape Presidencia, Bohol	do.	Ninety per cent finished.
103. Bagulin Presidencia	do.	Under study.
104. San Carlos Park, Pangasinan	Development plan	Do.
105. Cabanatuan Park and Monument, Nueva Ecija.	do.	Finished.
106. Moncada Plaza, Tarlac	do.	Under study.
107. Bustos Plaza and Monument, Bulacan.	do.	Do.
108. Batangas Plaza, Batangas	do.	Fifty per cent finished.
109. San Jose Plaza, Batangas	do.	Under study.
110. Tabaco Plaza, Albay	do.	Fifty per cent finished.
111. Hinigaran Plaza, Occidental Negros	do.	Finished.
112. Bacolod Park, Occidental Negros	do.	Under study.
113. Dumangas Plaza, Iloilo	do.	Finished.
114. Bulan Town Plan, Sorsogon	Development plan	Do.
115. Proposed San Juan Park, Rizal	do.	Fifty per cent finished.
116. Badoc Town Plan	do.	Under study.
117. Pasay Town Plan, Rizal	do.	Finished.

MAIN CANAL, PEÑARANDA IRRIGATION SYSTEM, NUEVA ECIJA PROVINCE

PROVINCIAL PROJECTS—Continued

Name of projects	Character	Status
118. Batangas Town Plan	Development plan	Fifty per cent finished.
119. Calabangan Town Plan, Camarines Sur.	....do	Under study.
120. Cagayan Town Plan and Presidencia, Misamis.	....do	Fifty per cent finished.
121. Zamboanga Town Plan, Zamboanga	....do	Under study.
122. Muñoz Agricultural School Hospital, Nueva Ecija.	....do	Finished.
123. Cebu Hospital Group, Cebu	....do	Do.
124. San Jose Hospital, Antique	Location plan	Do.
125. Hospital and Jail, Cagayan Misamis	....do	Fifty per cent finished.
126. Lingayen High School Campus, Pangasinan.	Development plan	Ninety per cent finished.
127. Tacloban High School, Leyte	Location plan	Under study.
128. Calle España Extension to New Manila and San Francisco del Monte.	Location plan	Finished.
129. Layac-Balanga Road and Layac-Dinalupihan Road Intersection.	Development plan	Do.
130. Intersection of San Pablo-Santa Maria Road with Santa Cruz Beach Road.	....do	Do.
131. Subdivision of Lot 24, Section K, Baguio.	Plan	Do.
132. Proposed subdivision for the estate of Mr. V. Urgello, Cebu, Cebu.	Plan	Do.

IRRIGATION DIVISION

NICANOR CORTES, *Chief Irrigation Engineer*

IRRIGATION PROJECTS

There were 3 irrigation projects under construction, 16 in operation, 3 approved for construction, and 65 under consideration during 1929.

The 3 systems under construction command an aggregate area of 25,200 hectares and are estimated to cost, completed, ₱6,210,935. It is expected that the Peñaranda River Irrigation Project will be completed in time to deliver water by May, 1930, and will place under irrigation, for the first time, approximately 12,000 hectares of land. The Laoag-Vintar Irrigation Project can also be completed by June, 1930, if funds are made available at an early date for the completion of the project. The South Side System, however, has been in continuous operation since October 15, 1928, serving approximately 3,000 hectares of land.

The 16 government irrigation systems in operation, including the extensions which have been completed from time to time, command an aggregate area of 67,020 hectares, and were completed at a cost of ₱12,359,369, excluding the cost of operation and maintenance during the first year following the opening of the system.

The release of ₱600,000 for the Pampanga River Irrigation Project was authorized by the Honorable, the Secretary of War on November 11, 1929, sustaining the release of funds made by His Excellency, the Governor-General on February 18, 1929. Construction work is planned during the early part of 1930.

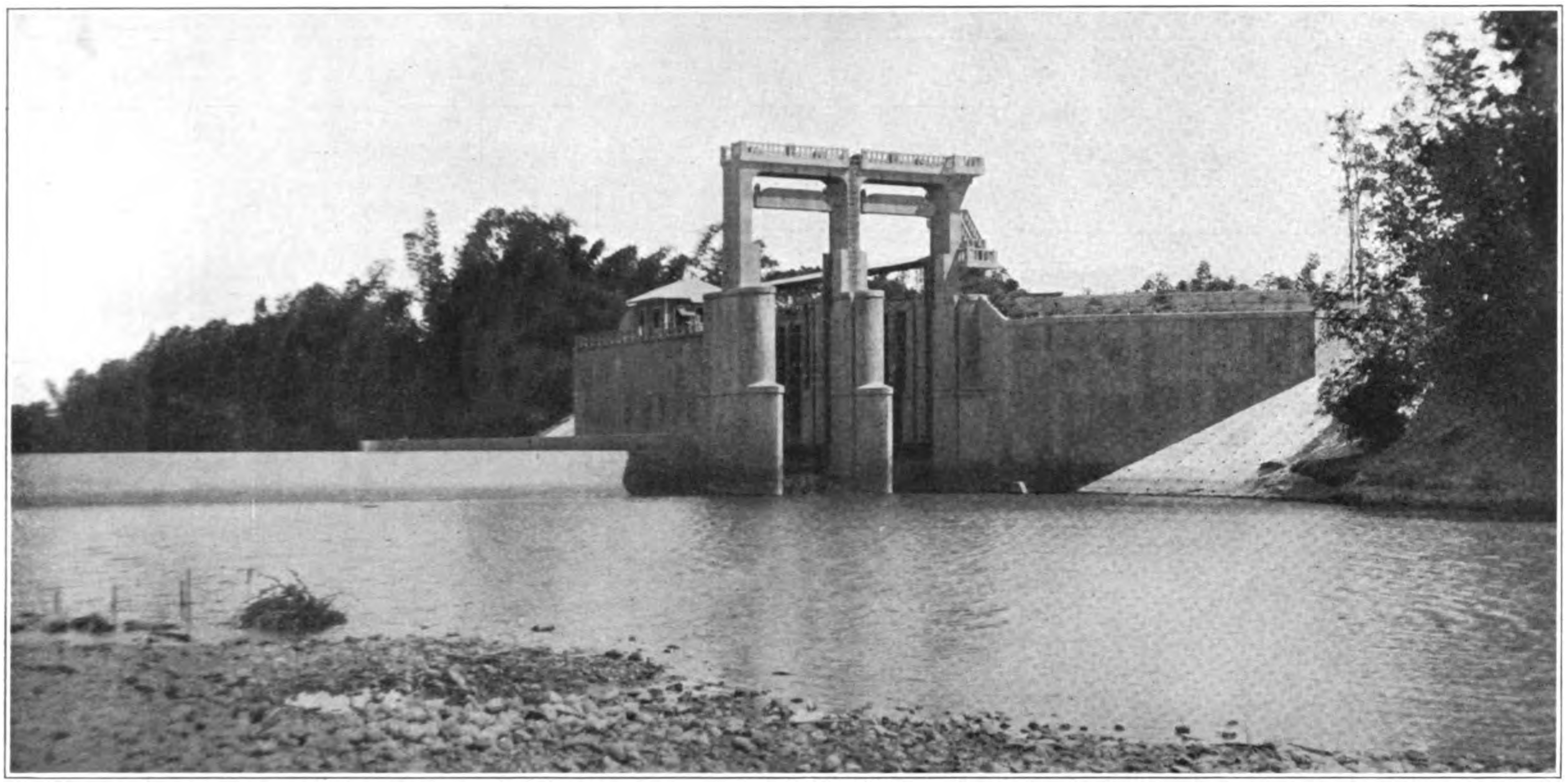
The Balaoan Irrigation Project and the extension of Amburayan River Irrigation System are held pending action of the Provincial Board of La Union.

After providing funds for projects under construction and for improving existing systems there will be left a balance of ₱131,838.95 from the ₱20,000,000 bond fund authorized by Act 3011 and Section 7 of Act 3013.

PROJECTS UNDER CONSTRUCTION

Work was under way during the past year on the projects shown in Table II under the heading, "Systems under Construction." The status of each of these projects is briefly described hereunder:

Peñaranda River Irrigation Project, Nueva Ecija and Bulacan Provinces.—This project was 85 per cent completed at the end of 1929. The diversion works, under contract with Mr. F. T. Ryan, were completed in June, 1929, at a total cost of ₱660,000. The large canal structures were completed during 1928. The excavation of the main canal, undertaken by subcontractors Gordon and Haley Construction Company and that of laterals and sub-laterals, by Mr.



DIVERSION WORKS SHOWING SLUICEGATE, PEÑARANDA IRRIGATION SYSTEM, NUEVA ECIJA PROVINCE

Sotero Baluyot, progressed satisfactorily during the past year. Contract for the construction of sub-lateral headgates, turnouts and other small canal structures was entered into with Mr. S. Nagauye on August 21, 1929. The progress made in construction work justifies the expectation that the project will be in operation by May, 1930.

Laoag-Vintar Irrigation Project, Ilocos Norte Province.—The South Side System was in operation during the past year and irrigated approximately 3,000 hectares of land. An allotment of ₱30,000 was made on May 5, 1929, to cover an overdraft and the operation and maintenance expenses of the system during the past year. The allotment requested for the completion of the project has not as yet been made.

Dipolog Irrigation Project, Zamboanga Province.—Work on this project was confined to the maintenance of completed canals and structures. Construction work was suspended on account of lack of funds. The construction of a complete drainage system was carefully studied with a view to assuring the success of the project.

TABLE I.—IRRIGATION SYSTEMS IN OPERATION

Name of irrigation system	Classification	Province	Date of official opening	Irrigated area	Cost of construction	Average yield cavans per hectare		Number of water masters	Number of ditch tenders	Other employees	Plan of payment		Total charge to be collected	Amount collected up to December 31, 1929	Per cent collected
						By province	By systems				Amortization	Assessment			
				Hectares											
1. Agana River	Insular	Iloilo	Jan. 1, 1925	6,800	₱917,000	17.56	47.6	3	17	6	₱11.66		₱230,949.86	₱169,587.84	73
2. Amburayan River	do	La Union	June 1, 1926	4,000	1,156,000	23.77	51.1	2	11	5	18.29	₱12.00	108,080.00	36,171.18	34
3. Angat River	do	Bulacan and Pampanga	July 1, 1926 May 1, 1926	23,124	5,823,769	27.78		11	61	52	15.11	12.00	407,886.61		
4. Ayala	Municipal	Zamboanga	Feb. 1924	180	17,000	14.30									
5. Baruyen River	Insular	Ilocos Norte	Jan. 1, 1924	250	94,000	19.98	40.0	1	2	1	27.75	12.00	12,218.78	5,436.90	44
6. Dingras	do	do	Jan. 1, 1923	1,028	140,000	19.98	40.8	1	3	2	12.29	9.71	58,097.96	44,754.93	76
7. Naic	do	Cavite	July 1, 1923	680	292,000	23.76					22.26				
8. O'Donnell River	do	Tarlac	Jan. 1, 1927	4,012	710,000	27.77	30.0	2	10	4	12.79	10.88	56,775.67	10,925.12	19
9. Pilar	do	Bataan	Sept. 1, 1916	170	27,600	30.21	73				14.94		17,778.60	13,523.22	76
10. Santa Barbara	do	Iloilo	Dec. 1, 1922	5,000	737,000	17.56	41.9	2	13	6	12.41	10.11	262,049.66	218,704.07	83
11. Santa Maria	Municipal	Zamboanga	Feb. 1924	430	23,000	14.30									
12. San Miguel	Special	Tarlac	Aug. 1913	6,400	789,000	27.77		1	2	7					
13. Sibalom-San Jose	Insular	Antique	July 1, 1926	4,520	450,000	18.86	40.82	3	21	13	13.44	11.48	90,958.50	43,741.83	48
14. Tagudin	do	Ilocos Sur	Jan. 1, 1926	1,269	425,000	21.01	57.9				21.60	12.00			
15. Talavera River	do	Nueva Ecija	Nov. 15, 1923	9,457	1,218,000	43.92	66.6	3	27	8	9.21		408,725.99	318,266.86	78
16. Trinidad	Special	Mt. Province	Jan. 1921	200	40,000	14.37									
Total				67,020	12,359,369			29	167	104			2,053,021.62	862,111.95	

Nos. 4 and 11 operated by the Municipal Council of Zamboanga. No. 7 opera ted by the Bureau of Lands. No. 16 operated by the Bureau of Education.

TABLE II.—IRRIGATION SYSTEMS UNDER CONSTRUCTION

Name of irrigation system	Classification	Province	Date of beginning construction	Irrigable area	Estimated cost	Allotment made	Progress of construction	Remarks
1. Dipolog	Insular	Zamboanga	August 1919	1,000	126,750	₱114,250	60% completed	
2. Laoag-Vintar	do	Ilocos Norte	January 1923	6,200	2,505,000	2,310,000	85% completed	
3. Peñaranda River	do	Nueva Ecija	January 1924	18,000	3,404,185	3,404,185	85% completed	To be completed June, 1930.
				25,200	6,035,935	5,828,435		

TABLE III.—IRRIGATION SYSTEMS APPROVED FOR CONSTRUCTION

Name of irrigation system	Classification	Province	Irrigable area	Estimated cost	Remarks
			Hectares		
1. Amburayan River Extension	Insular	La Union	1,200	₱250,000	Construction of this project held pending final action on Balaoan Project.
2. Balaoan	do	do	1,000	150,000	Construction held pending action of Provincial Board.
3. Pampanga River	do	Nueva Ecija	20,500	4,000,000	Construction held pending release of funds.
Total			22,700	₱4,400,000	

IRRIGATION SYSTEMS APPROVED FOR CONSTRUCTION

The Pampanga River and Balaoan Irrigation Projects and the extension of Amburayan River Irrigation System which were approved for construction in previous years were still awaiting construction in 1929. The status of the two last named projects remained unchanged during the last year.

IRRIGATION SYSTEMS IN OPERATION

Of the 16 government irrigation systems in operation, only 12 were administered by this Bureau. The Naic System was operated by the Bureau of Lands, the Trinidad by the Bureau of Education, and the Santa Maria and Ayala Systems by the Municipal Council of Zamboanga. A list of irrigation systems in operation is given in Table I.

During the early part of 1929, the activities of the Agricultural Service Section were discontinued pursuant to an understanding with the Department of Agriculture and Natural Resources which requires the Bureau of Plant Industry to handle this work in the future. The Agriculturist of this Bureau was also transferred to the Bureau of Plant Industry.

During 1929, the cost of operation and maintenance were limited to a budget prepared for each project. There was set up in each budget a reserve fund to be used for repairs, improvements and emergencies and this plan has proved to be successful and will be a permanent feature of the Operation and Maintenance program.

Data were gathered during the year by means of which the necessary personnel for each project was determined. The salaries of such personnel were also standardized for each project, to become effective January 1, 1930. Further investigations are being made to fix the individual duties of the operating personnel in order to efficiently administer the completed systems.

Records of the duty of water and water delivery are being studied and methods are being worked out for the gathering of accurate data in this respect so that the operation of a system can at all times be efficiently handled. Complaints received during the year of the shortage, or lack, of water for certain systems, make it necessary to keep records of water supply and delivery for all systems.

Two systems suffered damage from storms and high water, during the year, namely: the Angat System in Bulacan Province and the Sibalom–San Jose System in Antique Province.

The damage to the Angat System in September consisted of destruction of portions of the protective dikes on the north and south banks of the river with consequent damage to canals and structures in the immediate vicinity. The total damage to the canal system was estimated at ₱12,000. This flood was the highest ever recorded on the Angat River. The crops, in the immediate vicinity of the breaks in the dikes, were slightly damaged by silt and debris.

A flood occurring on November 10th and 11th in the Tipuluan River, Antique Province, caused considerable damage to the river control works maintained at the headworks of the Sibalom–San Jose Project. The river shifted its canal about one kilometer away from the headworks of the system. The necessary spur dykes to change the river back to its former channel and to maintain it in its old channel are estimated to cost ₱9,500.

Excluding the Baruyen Project, the operation of the completed systems has been fairly satisfactory. The latest reports indicate that the production during the year under discussion will exceed the production for 1928. However, it is doubtful whether the financial returns of the farmers will show any improvement, due to other factors that have arisen to adversely affect the market price of palay in the principal rice growing regions.

Pursuant to the provisions of Act 3523, which became effective on February 21, 1929, irrigation charges have been revised on all projects, except the Pilar and Talavera Projects, to which this act does not apply. Briefly stated, this Act provides for either a maximum charge up to ₱12 per hectare, under the annual assessment plan, or a 40-year amortization plan. The plan to be followed depends upon the choice of the landowners, determined strictly in accordance with said Act.

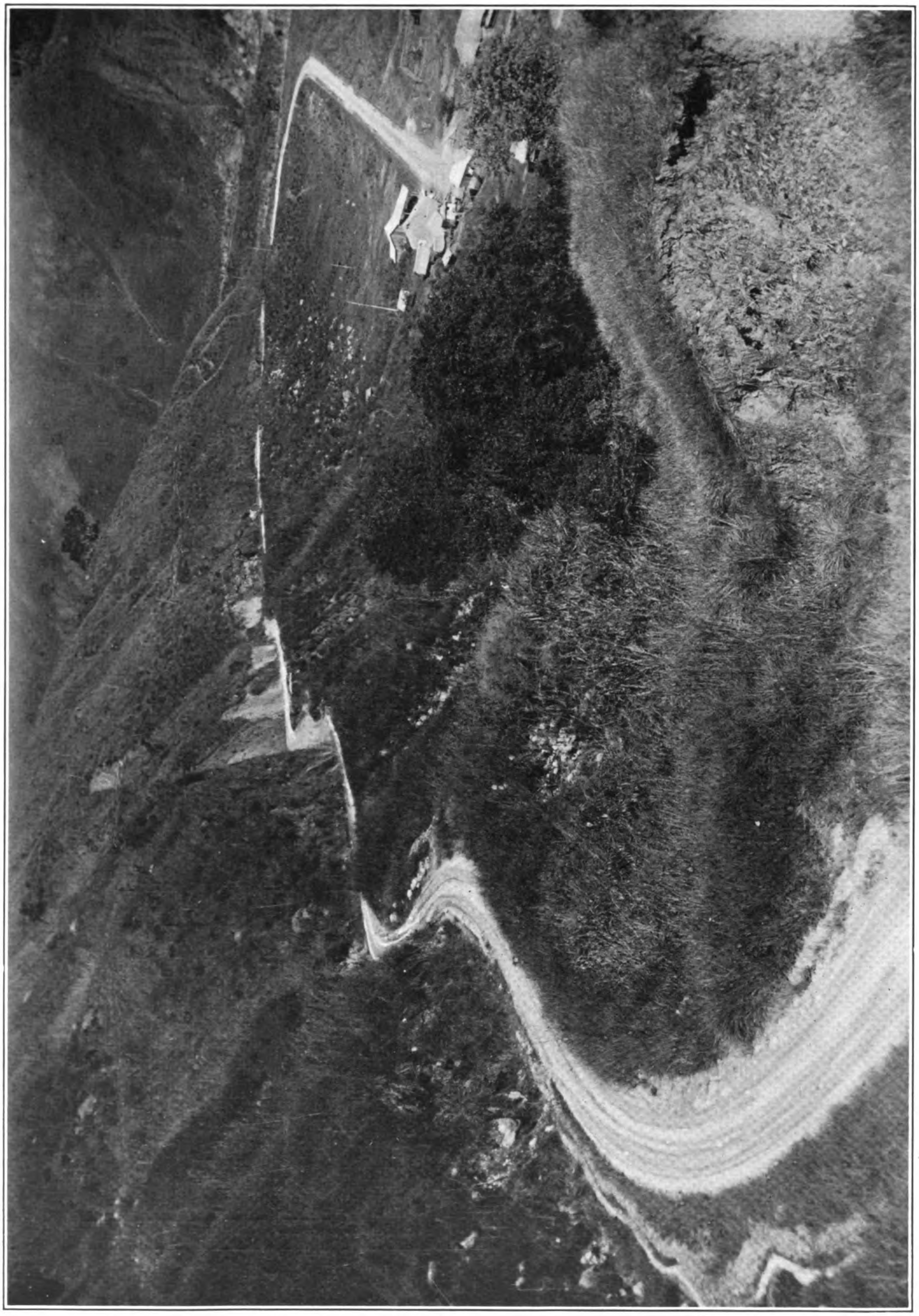
The new charges were duly advertized by irrigation notices and the final dates for expressing a choice expired on November 14, 1929. On those systems affected by Act 3523, where the charge was more than ₱12 per hectare per year for 40 years, the choice of the landowners indicated that the annual assessment plan would become effective.

Act 3523 also provides for penalties in case of delinquency in the payment of irrigation charges, which should encourage landowners to make prompt payments in future.

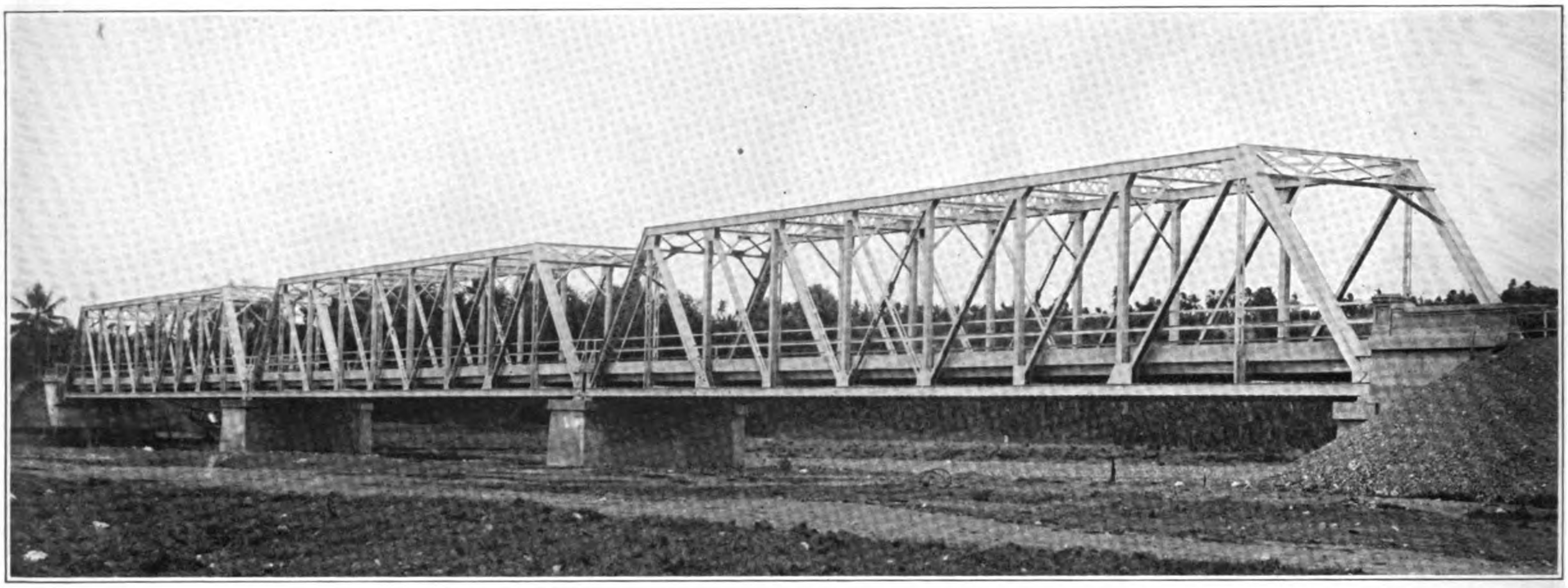
The readjustment of charges according to Act 3523 has already resulted in increased collections and it is expected that collections will be less difficult hereafter. The amount collected at the end of the year was 61 per cent of the total amount due. Table IV shows the adjustment of irrigation charges made under the provisions of Act 3523.

The construction of additional farm ditches and minor structures during the year on all projects greatly improved the delivery of water. However, much remains to be done in this respect as landowners are usually reluctant to construct, or coöperate in the construction of, farm ditches. The physical maintenance of canals is not entirely satisfactory due to various reasons, but efforts are being made to improve this phase of the operation work.

There are several projects on which the following major improvements are to be carried out before next irrigation season:



CAGAYAN VALLEY ROAD, BALETE-SANTA FE SECTION



MANANGA RIVER BRIDGE, CEBU PROVINCE

TABLE IV.—ADJUSTMENTS OF CHARGES FOR IRRIGATION SYSTEMS IN OPERATION UNDER ACT 3523

System	Province	Amount originally allotted	Allotments to cover proposed improvement	Total allotments	Operation and maintenance cost first year		Total cost	Annual charges per hectare		Plan of payment chosen
								Amortization 40 years	Assessment	
Angat	Bulacan	₱5,198,768.99	₱125,000.00	₱5,323,768.99	(1926)	₱38,627.11	₱5,362,396.10	₱15.11	₱12.00	Assessment.
Aganan (Aganao)	Iloilo	917,000.00		917,000.00	(1925)	3,658.35	920,658.35	11.66		Amortization.
Amburayan	La Union	1,156,000.00		1,156,000.00	(1926)	7,397.02	1,163,397.02	18.29	12.00	Assessment.
Baruyen	Ilocos Norte	89,000.00	5,000.00	94,000.00	(1924)	[b] 11,366.68	105,366.68	27.75	12.00	Do.
Dingras	do	130,000.00	10,000.00	140,000.00	(1923)	3,341.43	143,341.43	12.29	9.71	Do.
O'Donnell	Tarlac	[a] 650,000.00	60,000.00	710,000.00	(1927)	[c] 13,936.34	723,936.34	12.79	10.88	Do.
Santa Barbara	Iloilo	692,000.00	45,000.00	737,000.00	(1923)	10,639.98	747,639.98	12.41	10.11	Do.
Sibalom–San Jose	Antique	450,000.00	[e] 350,000.00	[f] 780,000.00	(1926)	1,117.61	781,117.61	13.44 11.64	11.48	Do.
Tagudin	Ilocos Sur	395,000.00	30,000.00	425,000.00	(1926)	[d] 6,394.00	431,394.00	21.60	12.00	Do.
Totals		9,677,768.99	605,000.00	10,282,768.99		96,478.52	10,379,247.51			

[a] Includes the sum of ₱300,000, the share of the project in the cost of San Miguel Dam.
[b] Includes operation and maintenance cost of previous years and loss due to reduction of irrigated area.
[c] Includes operation and maintenance cost for year 1926.
[d] Includes operation and maintenance cost for year 1925.
[e] Allotment not yet made.
[f] See (*e*).

1. A stoney gate and headworks projection are to be constructed on the Santa Barbara Project. The sum of ₱45,000 has been set aside for this purpose and the work will be done by administration as all bids received for the work have been rejected.

2. A sluiceway channel with stoney gate is being constructed under contract with Mr. Clemente Bundalian on the O'Donnell system. The amount authorized for this work is ₱60,000.

3. The improvement of the headworks of the Dingras system is being done by administration, the sum of ₱10,000 being available for this purpose.

4. The main canal and portions of the laterals of the Baruyen system will be lined to prevent excessive seepage. Repairs to flumes will also be made. The sum of ₱5,000 is available for this work which will be done by administration, all bids having been rejected.

PROJECTS UNDER CONSIDERATION

There are 65 irrigation projects under consideration, covering a total area of approximately 292,000 hectares. Preliminary studies have been completed for 18 projects, commanding an aggregate area of 113,525 hectares and estimated to cost approximately ₱24,242,500. Topographic surveys have been completed for 17 projects commanding an aggregate area of approximately 63,970 hectares. There were 30 projects awaiting investigation, which are estimated to command approximately 114,800 hectares. The irrigation projects under consideration are listed below under the following headings: "Projects with Preliminary Studies Completed," "Projects with Topographic Survey Completed" and "Projects Awaiting Investigation."

PROJECTS WITH PRELIMINARY STUDIES COMPLETED

Province	Project	Irrigable area	Estimated cost	Remarks
		Hectares		
1. Ilocos Norte	San Nicolas Extension, Laoag-Vintar Irrigation System.	1,500	₱256,000.00	
2. Ilocos Sur	Candon	1,290	134,000.00	
3. Ilocos Sur	Santa Cruz	1,170	257,000.00	
4. Ilocos Sur	Santa Lucia	1,380	106,000.00	
5. Iloilo	Jalaur River	15,800	4,540,000.00	
6. Iloilo	Sibalom River	1,760	267,000.00	
7. Laguna	Santa Cruz	5,000	1,330,000.00	
8. Leyte	Barugo	755	240,000.00	
9. Mountain province.	Mainit–Bontoc	490	117,000.00	
10. Nueva Vizcaya	Murong	1,870	130,000.00	
11. Palawan	Iwahig	700	60,000.00	With free labor.
12. Pampanga	Lower Pampanga River.	11,000	3,480,000.00	Studies made.
13. Pangasinan	Agno River	43,150	8,000,000.00	
14. Rizal	Baras	320	58,000.00	
15. Rizal	Morong	320	72,500.00	
16. Rizal	Pililla	300	60,000.00	
17. Tarlac	Tarlac River	20,720	4,200,000.00	Landowners opposed to construction.
18. Zambales	Santo Tomas	6,000	935,000.00	
Total		113,525	24,242,500.00	

RICE TERRACES, BONTOC-BANAUE ROAD, MOUNTAIN PROVINCE

PROJECTS WITH TOPOGRAPHIC SURVEYS COMPLETED

Province	Project	Irrigable area	Remarks
		Hectares	
1. Bataan	Orion	1,270	
2. Camarines Norte	Daet	2,000	
3. Camarines Sur	Talisay-Indan	5,000	
4. Camarines Sur	Pauili Valley	2,000	
5. Cavite	Maragondon	1,400	
6. Iloilo	Pototan	2,300	Survey and preliminary design made.
7. La Union	Bacnotan	1,000	
8. La Union	Rosario	1,000	
9. Occidental Negros	Bago	20,000	Preliminary estimate of cost made.
10. Occidental Negros	Binalbagan-Himamaylan	3,000	
11. Pampanga	Bamban River	3,000	
12. Pampanga	Gumain River	5,000	
13. Pampanga	Porac River	1,000	
14. Pangasinan	Banila River	5,000	
15. Pangasinan	Mangatarem River	2,000	
16. Pangasinan	San Fabian	4,000	
17. Rizal	Mariquina Valley	5,000	
Total		63,970	

PROJECTS AWAITING INVESTIGATION

Provinces	Projects	Irrigable area	Remarks
		Hectares	
1. Abra	Abra River	4,000	
2. Albay	Quinali-Lake Bato	6,000	
3. Albay	Malinao-Tabaco	600	
4. Bataan	Dinalupihan	2,500	
5. Batangas	Balayan	300	
6. Batangas	Batangas	1,000	
7. Batangas	San Juan de Bocboc	1,000	
8. Camarines Sur	Barit River	2,000	
9. Camarines Sur	San Jose-Lagonoy	5,000	
10. Capiz	Maayon	2,000	
11. Capiz	Ibajay	500	Preliminary investigation, 1911.
12. Capiz	Macato-Malinao	1,200	Do.
13. Capiz	Mambusao	1,000	Do.
14. Cebu	Balamban River	1,200	
15. Ilocos Sur	Abra River	10,000	Preliminary survey completed, 1908.
16. Isabela	Magat River	40,000	
17. La Union	Agoo-Tubao	2,000	
18. La Union	Naguilian	1,000	Preliminary survey completed.
19. La Union	San Juan	1,000	
20. Leyte	Palo River	1,000	Preliminary investigation completed.
21. Leyte	Dagami-Tanauan	14,000	
22. Leyte	Bato-Hilongos	3,000	
23. Mindoro	Bucayao River	2,000	
24. Occidental Negros	Silay	5,000	
25. Oriental Negros	La Granja Extension Station.	200	Investigation in progress.
26. Oriental Negros	Tanjay	800	
27. Oriental Negros	Tolong	3,000	Preliminary investigation made.
28. Tayabas	Mayao	2,500	
29. Zambales	Iba	400	Preliminary survey completed.
30. Zambales	Toton-Lanom	600	Do.
Total		114,800	

WATER RIGHTS

The Water Right Section received during the year a total of 255 new applications for water rights, 241 of which are for irrigation and 14 for power development purposes. A total of 237 applications were finally acted upon, 193 of which were granted and 44 disapproved by the Honorable, the Secretary of Commerce and Communications, upon the recommendation of the Irrigation Council. The water rights granted for irrigation purposes were based on irrigating 15,451.45 hectares of land.

There were 14 applications for the development of power filed during the year 1929. Five applications for power development were approved for developing a maximum of 6711 horse power.

Three streams were designated for adjudication of water rights during the year 1929.

Adjudication on four streams (Banila, Andulan, Parasapas, and Bued or Nantayangan Rivers and their tributaries) were completed, making the total number of streams so adjudicated 34.

Provisional lists of priorities for the following streams which have been surveyed and investigated are being prepared:

Stream	Year adjudication authorized	Province	Number of diversion ditches	Length of main canal in meters	Number of municipalities affected	Approximate number of hectares of land irrigated
San Juan River	1926	Bataan	14	12,900	1	100
Bugu and Buge Esteros	1918	Tarlac			1	3,000
Parua and Balen Rivers	1924	Pampanga and Tarlac.			3	11,000
Totals						14,100

LUCENA-DALAHICAN ROAD, TAYABAS PROVINCE

Surveys and investigations on the following streams have been suspended due to lack of funds:

Stream	Year adjudication authorized	Province	Municipalities affected	Approximate area of land irrigated in hectares
Maoguing-oguing River	1919	Ilocos Norte	Dingras	500
Lubnac Estero	1920	do.	Sarrat	300
Burnay River	1921	do.	Solsona and Dingras	1,500
Nagdesaagan River	1922	do.	Piddig	800
Maolo River	1922	Pangasinan	Sison and Pozorrubio	2,500
Padsan River	1923	Ilocos Norte	Banna	1,900
Total				7,500

The streams which have been designated for adjudication which no work has been accomplished are given below:

Stream	Year adjudication authorized	Province	Municipalities affected	Approximate area of land irrigated in hectares
Ynarihan River	1915	Camarines Sur	Naga, Magarao, and Calabanga.	1,200
Balingasay Estero	1919	Ilocos Norte	Sarrat	300
Banglayan River	1922	Ilocos Sur	Narvacan	2,200
Codoog or Barangubong River.	1922	do.	Narvacan and Nagbukel	1,000
Pias Estero	1922	Tarlac	Moncada and San Manuel.	5,000
Nagubuuban Estero	1923	Ilocos Norte	Badoc	300
Imanduyan or Aloragat River.	1924	Pangasinan	Mapandan, Manaoag, Binalonan, Pozorrubio and Sison.	5,000
Del Carmen Creek	1924	Pampanga	San Fernando and Mexico.	5,000
Matua Creek	1924	do.	Santa Rita, Guagua, Bacolor and Porac.	800
Labasin and Bulaquin Rivers.	1925	Laguna and Tayabas	Tiaong, Dolores, and San Pablo.	300
Lusuac Spring	1926	Abra	Bangued and Peñarubia	300
Lagasit River	1926	Pangasinan	Tayug, Santa Maria, San Quintin, Rosales, and Balungao.	2,000
Santa Maria or Villavieja River.	1926	Ilocos Sur and Abra	Narvacan, Santa Maria and Pilar.	2,000
Paed River	1926	Pangasinan	Alaminos	300
Talavera River	1927	Nueva Ecija	Carranglan, Muñoz, Santo Domingo, Talavera, Quezon, Aliaga and Zaragoza.	9,000
Gasgas River	1927	Ilocos Norte	Solsona	551
Caagusan, Balucoc and Paligue Creeks	1927	Tarlac	Concepcion	2,000
Mitura and Macalong Rivers.	1927	Pangasinan	San Manuel, Asingan, Binalonan and Mapandan.	8,000
Paranum and Pandacaque Creeks.	1928	Pampanga	Angeles, Arayat, Mabalacat, Mexico and Magalang.	4,000
Pagang Creek	1928	Mountain Province	Sadanga	500
Til-layon Creek	1929	Ilocos Norte	Badoc and Nueva Era	100
Madamag River	1929	do.	Dingras	300
Salpad-Naboongan Spring.	1929	do.	Piddig	100
Total				50,251

The Irrigation Council met three times during the year and acted upon a total of 237 water right applications and two sets of rules and regulations for irrigators' associations.

A large number of water right controversies were investigated by the Bureau's personnel and acted upon by the Honorable, the Secretary of Commerce and Communications.

There were 3,213 certificates of apportionment of water according to priority issued and about 5,000 certificates were still pending.

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the Division made 1,313 discharge measurements at permanent gaging stations and 92 discharge measurements at temporary gaging stations during 1929. Gagekeepers kept daily gage heights records at 120 permanent gaging stations. Systematic gagings of all main canals and some of the larger laterals of Government irrigation systems in operation were also made. Records were kept for 36 gages established in localities distant from the Weather Bureau's gages. Hydrographs showing, "Weekly mean," "mean wet," "mean dry" and absolute minimum for each permanent gaging station were plotted and traced.

There were 14 river control projects during 1929 for which funds were made available. Plans and specifications for ten of these projects were prepared by the Division and construction work was undertaken by district engineers. These projects are enumerated hereunder:

Name	Province	Municipality	Estimated cost	Type of work	Remarks
1. Gamut River Control	Albay	Oas	₱15,000	Channel improvement and earth dyke and permeable dyke.	Relief fund. Under construction.
2. Pagsanjan River Control	do.	Pandan	8,000	Dyke and channel improvement.	Do.
3. Calacran River Control	do.	Libon	20,000	Dyke extension and repair	Appropriation Act. Under construction.
4. Angat Dyke	Bulacan	Quingua	20,000	Earth dyke	Do.
5. Argao River Control	Cebu	Argao	9,000	Bamboo revetment and cut-off channel.	Relief fund. Under construction.
6. Carcar Dyke	do.	Carcar	27,000	Dyke and cut-off channel	Appropriation Act. Pending construction.
7. San Isidro River Improvement.	do.	San Fernando	5,000	Channel improvement	Relief fund. Under construction.
8. Boac River Bank Revetment.	Marinduque	Boac	10,000	Repair Bank Revetment	Do.
9. Magat River Control	Nueva Vizcaya	Bayombong	15,000	Bamboo revetment and permeable dyke.	Funds from Bureau of Non-Christian Tribes—completed.
10. Pampanga River Dyke	Pampanga	(San Simon, Arayat, San Luis, Apalit).	25,000	Earth dyke maintenance	Appropriation Act.
11. Agno River Control	Pangasinan	Galarin, Urbiztondo	50,000	Earth dyke and maintenance	Do.
12. Bayambang Dyke	do.	Bayambang	100,000	Earth dyke and bank revetment.	Approppriation Act. Under construction.
13. Casalugan River Control	Romblon	Romblon	10,000	Channel improvement and concrete revetment.	Relief fund. Under construction.
14. Cadacan River Control	Sorsogon	Sancayon	10,000	Channel improvement	Relief fund. Completed.

SEWERAGE SYSTEMS

The construction of the Vigan Domestic Sewerage System, Ilocos Sur, was reported 97 per cent complete at the end of the year. This project is estimated to cost ₱110,000. The work was financed from the proceeds of a bond issue by the municipality of Vigan. The construction of the Lucena Storm Drain System, Tayabas, was reported 96 per cent complete at the end of the year. This project is estimated to cost ₱150,000.

Preliminary plans and estimates of cost have been prepared for the following projects:

1. Batangas Domestic Sewer System, Batangas Province	₱95,000.00
2. Cavite Domestic Sewer System, Cavite, Province	95,000.00
3. Cavite Storm Drain System, Cavite Province	80,000.00
4. Cebu Domestic Sewer System, Cebu Province	440,000.00
5. Lucena Domestic Sewer System, Tayabas Province	120,000.00
6. Zamboanga Domestic Sewer System, Zamboanga Province	130,000.00
Total	960,000.00

WATERWORKS

The division prepared plans and specifications for 27 provincial and municipal waterworks projects on which construction work was started during 1929. These projects will furnish potable water to a population of 59,880 at an estimated cost of ₱723,000. Preliminary designs and estimates of cost were also made for 30 provincial and municipal waterworks projects, most of which are to be financed from loans. These projects were designed to supply 94,400 people at an estimated cost of ₱1,727,800.

Construction work was completed by district engineers on 24 waterworks projects including four extensions and two improvements, started during previous years, leaving 78 projects under construction at the end of the year. The completed projects cost ₱570,319.23 and serve a total population of 64,725 while the 78 projects still under way are estimated to cost completed ₱6,186,700 and will provide a potable water supply for 351,110 people. The pipe and other materials required for the 27 waterworks projects on which construction was started were imported from the United States and Europe during the latter part of the year.

There were 117 waterworks projects under consideration which contemplate furnishing water to a total population of 387,800 and are estimated to cost approximately ₱7,000,000. As soon as the municipalities concerned are able to finance these projects, construction work will be undertaken, excepting a few projects which require further investigation.

There have been completed thus far 196 municipal and provincial water supply systems and 8 extensions in the Philippine Islands, excluding the Manila Metropolitan Water System, which furnish potable water to a total population of 642,377 and have cost ₱7,277,217.10.

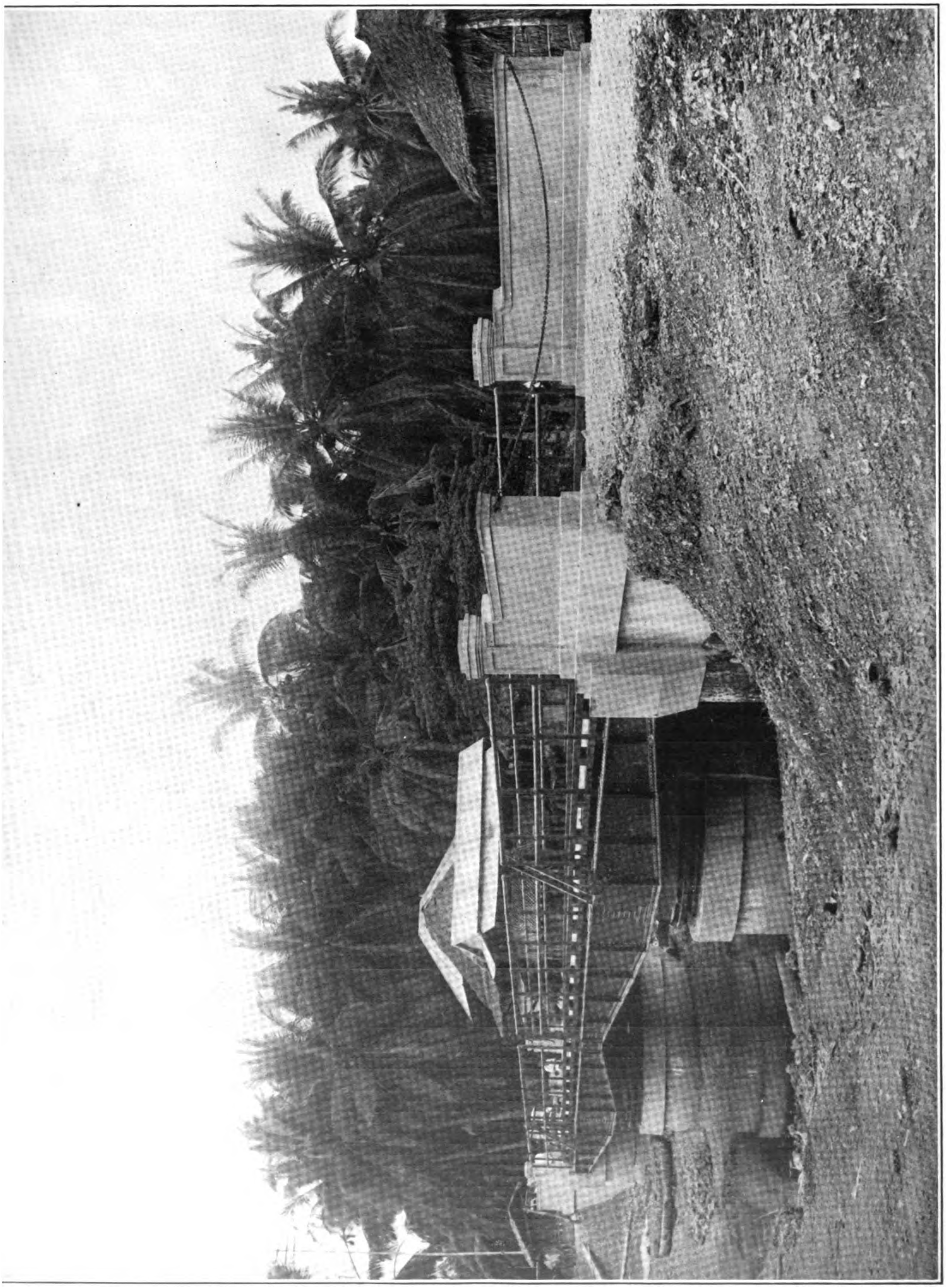
The status of all waterworks projects to date is shown in the accompanying lists as follows:

Table A.—Waterworks projects under construction.
Table B.—Waterworks projects completed.
Table C.—Waterworks projects under consideration.

TABLE A.—WATERWORKS PROJECTS UNDER CONSTRUCTION

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Albay	Bacacay [a]	Gravity	3,000	₱39,000.00		₱15,000.00
Do.	Ligao–Oas	do.	12,000	190,000.00	₱90,000.00	55,000.00
Do.	Tabaco	do.	5,500	46,000.00	30,000.00	15,000.00
Antique	Barbaza	do.	1,500	19,000.00	11,000.00	8,000.00
Do.	Pandan [a]	do.	1,500	24,000.00	14,000.00	10,009.50
Do.	Patnongon	do.	1,000	14,000.00	2,000.00	10,000.00
Batanes	Itbayat [a]	do.	1,000	15,000.00	6,000.00	3,155.63
Batangas	Bolbok [a]	Pumping	3,000	45,000.00		26,410.83
Bohol	Dimiao [a]	Gravity	2,000	37,000.00	20,000.00	12,286.97
Do.	Loay Extension [a]	do.		11,000.00	6,000.00	4,763.50
Do.	Loon	do.	5,000	33,000.00	22,000.00	11,000.00
Do.	Valencia [a]	do.	2,000	24,000.00	12,000.00	12,185.69
Bulacan	Bulacan	Pumping	6,000	80,00a.00	50,000.00	25,000.00
Do.	Hagonoy	do.	8,000	80,000.00	45,000.00	33,400.00
Do.	Marilao	do.	1,200	6,000.00	4,000.00	2,000.00
Do.	Meycauayan	do.	6,000	70,000.00	45,000.00	25,000.00
Do.	San Miguel	do.	7,000	75,000.00	50,000.00	25,000.00
Cagayan	Tuguegarao	Gravity	10,000	200,000.00	75,000.00	112,500.00

[a] Projects started during 1929.



DAYHAGON CHANNEL SWING BRIDGE, CEBU PROVINCE

TABLE A.—WATERWORKS PROJECTS UNDER CONSTRUCTION—Continued

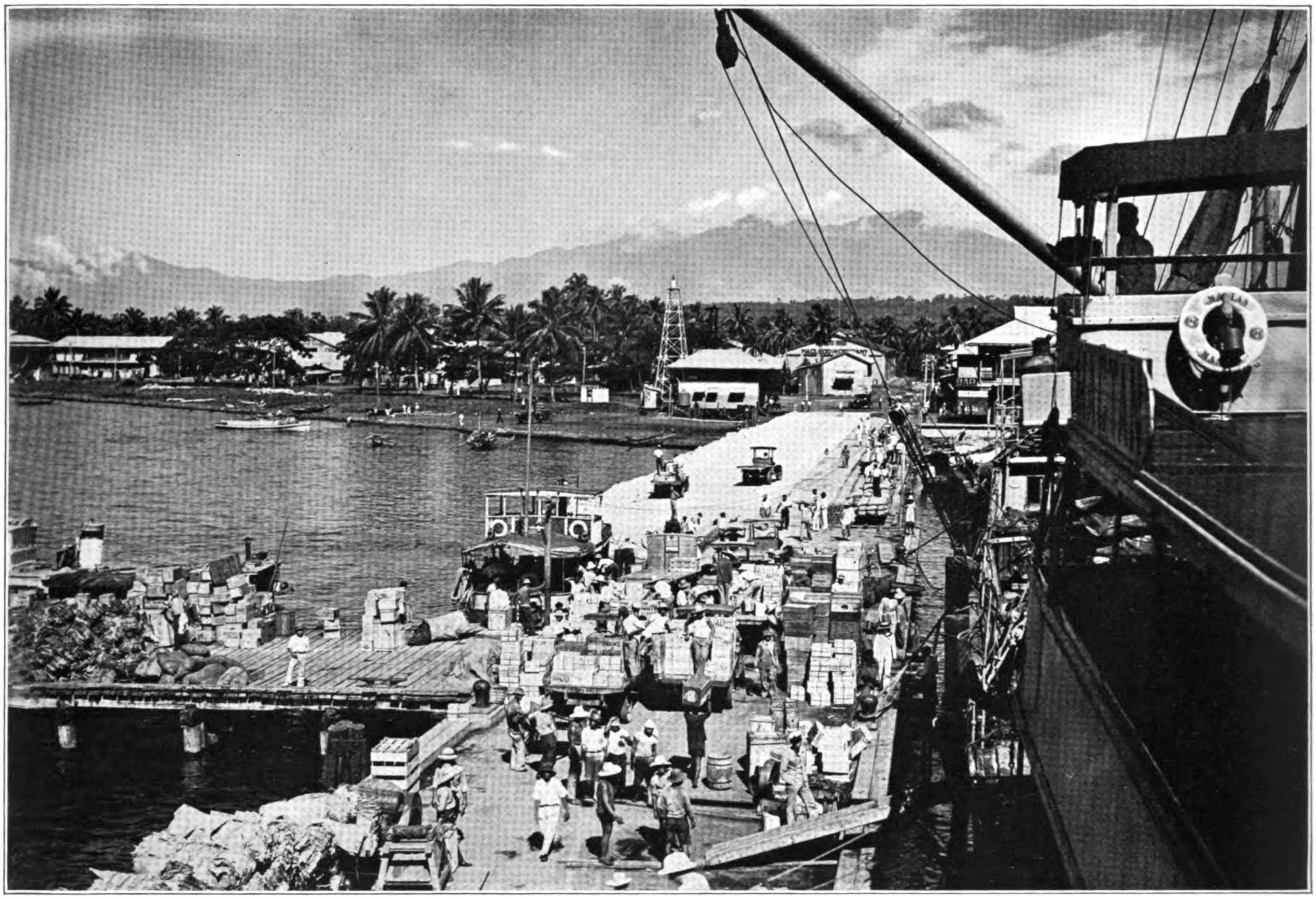
Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Camarines Sur.	Camarines Sur Metropolitan Waterworks	Gravity	14,000	₱330,000.00	₱91,500.00	₱213,813.18
Do.	Pasacao	do.	1,000	5,100.00	3,100.00	2,000.00
Capiz	Capiz–Ivisan	do.	8,000	186,000.00	72,000.00	58,000.00
Cavite	Dasmariñas [a]	do.	5,000	31,000.00	14,000.00	7,156.50
Cebu	Barrio Esperanza, Poro [a]	do.	500	7,000.00	4,700.00	2,500.00
Do.	Barrio Dapdap, etc., Pilar [a]	do.	1,000	9,000.00	6,000.00	3,000.00
Do.	Barrio Malones, etc., Dalaguete [a]	do.	1,600	25,000.00	12,000.00	6,087.09
Do.	Barrio Villahermosa, Tudela [a]	do.	500	6,000.00	4,000.00	2,000.00
Do.	Carcar Improvement	do.	4,000	30,000.00	20,000.00	10,000.00
Do.	Cebu Extension to Pardo	do.		89,000		50,000.00
Do.	Minglanilla	do.	1,500	12,000.00	8,000.00	4,000.00
Do.	Moalboal Extension	do.	3,000	25,000.00		8,400.00
Iloilo	Iloilo Metropolitan Waterworks	do.	91,500	2,100,000.00	299,700.00	1,585,438.56
Do.	Pototan-Dingle	do.	9,200	209,000.00	40,000.00	108,659.78
Do.	Sara [a]	do.	2,000	42,000.00	25,000.00	15,000.00
Ilocos Norte	Ilocos Norte Metropolitan Waterworks	do.	34,300	750,000.00	139,000.00	425,794.90
Ilocos Sur	Caoayan–Pandan	do.	1,700	18,000.00	12,000.00	7,500.00
Do.	Santiago	do.	1,300	18,000.00	12,000.00	6,000.00
La Union	Rosario	do.	1,050	10,000.00	6,600.00	3,570.14
Leyte	Baybay Agricultural School [a]	do.	500	8,000.00	5,300.00	2,700.00
Do.	Maripipi	do.	1,000	4,500.00	3,000.00	1,665.00
Do.	Merida	do.	1,000	10,500.00	7,000.00	3,500.00
Do.	Villaba [a]	do.	1,700	9,000.00	6,000.00	3,000.00
Masbate	Aroroy	do.	1,000	8,000.00	5,000.00	3,000.00
Do.	Masbate [a]	do.	4,000	56,000.00		36,000.00
Do.	San Fernando [a]	do.	2,500	20,000.00	13,300.00	6,666.66
Misamis	Cagayan Improvement	do.	5,000	38,000.00		34,339.25
Mountain Province	Bontoc	do.	2,000	36,000.00	24,000.00	12,000.00
Do.	Lubuagan	do.	1,200	8,000.00	5,000.00	
Occidental Negros	Bacolod	do.	8,000	202,000.00	85,000.00	112,441.24
Do.	Barrio Tobosa, Escalante	do.	800	16,000.00	10,700.00	6,000.00
Do.	Calatrava	do.	1,500	36,000.00	23,500.00	12,500.00
Do.	Murcia	do.	1,500	45,000.00	30,000.00	15,000.00
Do.	Silay [a]	Pumping	5,000	75,000.00	25,000.00	25,000.00
Oriental Negros	Ayungon [a]	Gravity	1,000	21,000.00		7,000.00
Do.	Manjuyod [a]	do.	2,000	12,000.00	6,000.00	6,000.00
Palawan	Bacuit	do.	1,000	3,200.00	2,500.00	700.00
Do.	Balabac Extension	do.	800	5,000.00	3,200.00	
Do.	Barrio Bintuan	do.	1,000	5,500.00	3,700.00	1,000.00
Do.	Culion	Gravity and pumping	5,000	45,000.00	39,000.00	
Do.	Cuyo	Pumping	800	10,000.00	6,650.00	3,000.00
Do.	Oton	Gravity	330	5,000.00	3,000.00	
Do.	Puerto Princesa Improvement	Pumping	400	4,500.00	3,000.00	1,500.00
Pampanga	Guagua	do.	6,000	70,000.00	25,000.00	21,777.00
Do.	San Fernando	do.	5,000	70,000.00	40,000.00	30,000.00
Rizal	Antipolo Improvement [a]	do.	4,000	25,000.00	25,000.00	
Romblon	Badajos	Gravity	1,500	24,000.00	14,000.00	9,000.00
Do.	Odiongan	do.	3,000	39,000.00	24,100.00	15,000.00
Samar	Wright [a]	do.	3,000	45,000.00		15,000.00
Sorsogon	Castilla [a]	do.	1,500	30,000.00		11,000.00
Sulu	Jolo Improvement [a]	do.	8,600	33,000.00	20,000.00	16,151.00
Tayabas	Atimonan	do.	6,000	102,000.00	39,500.00	50,000.00
Do.	Barrio Bondo, Mulanay [a]	do.	300	6,000.00	2,000.00	4,000.00
Do.	Barrio Hingoso, Macalelon	Rain tank		5,000.00		2,000.00
Do.	Casiguran	do.		5,000.00		4,000.00
Do.	Dolores [a]	Gravity	1,000	13,000.00		4,000.00
Do.	Laguimanoc	Rain tank		5,000.00		3,200.00
Do.	Pagbilao Improvement [a]	Gravity	1,330	55,000.00		22,000.00
Do.	Polillo	do.		12,400.00	3,000.00	9,398.64
Zambales	San Antonio	do.	4,000	54,000.00	3,674.33	One-third cost granted by Municipal Council and Provincial Board.
Total			351,110	6,186,700.00	1,737,724.33	3,494,171.06

[a] Projects started during 1929.

TABLE B.—WATERWORKS PROJECTS COMPLETED

Province	Municipality	Cost	Population served	System	Capacity of system gallons per day
Abra	Bangued	₱130,755.85	6,600	Gravity	180,000
Do.	Bangued Improvement [a].	16,148.28			
Albay	United States Reservation, Regan Barracks and Legaspi.	60,000.00	5,000	Pumping	259,200
Do.	Camalig	12,450.38	2,500	Gravity	100,000
Do.	Daraga–Legaspi [a]	171,628.63	20,000	do.	470,000
Do.	Jovellar	13,735.49	2,500	do.	122,000
Do.	Guinobatan	49,853.81	5,000	do.	288,000
Do.	Barrio San Miguel, Tabaco [a].	2,049.51	400	do.	5,760
Antique	Bugason	18,306.56	2,500	do.	44,000
Do.	Culasi	30,272.95	1,700	do.	100,000
Do.	San Jose	41,846.74	4,000	Pumping	47,520
Do.	Sibalom [a]	21,837.08	2,500	Gravity	50,000
Bataan	Sisiman	12,138.04	(Cattle)	do.	37,000
Batangas	Balayan	7,353.92	2,000	do.	100,000
Do.	Batangas	71,429.96	6,147	Pumping	144,000
Do.	Bauan	41,983.96	4,700	do.	93,600
Do.	Cuenca	5,000.00	2,500	Gravity	5,040
Do.	Lemery	47,132.84	7,200	Pumping	200,000
Do.	Lian [a]	4,507.27	3,000	Gravity	57,600
Do.	Lipa	103,065.87	5,000	Pumping	172,800
Do.	Rosario	20,232.67	5,000	do.	223,200
Do.	San Jose	44,089.45	4,000	Gravity	216,000
Do.	Santo Tomas	27,108.65	1,910	do	50,400
Batangas	Taal	₱91,188.34	5,000	Pumping	187,200
Do.	Taal Extension	57,220.41	4,000	do.	80,000
Do.	Talisay	15,562.81	2,130	Gravity	64,800
Do.	Tanauan	55,615.02	2,500	do.	45,000
Bohol	Anda	16,429.84	2,500	do.	100,800
Do.	Baclayon [a]	25,660.72	1,500	do.	18,400
Do.	Calape	26,521.41	2,600	do.	156,000
Do.	Dauis	5,100.00	840	do.	77,760
Do.	Duero	10,823.56	2,000	do.	86,400
Do.	Guindulman [a]	15,507.56	2,000	do.	70,560
Do.	Inabanga	45,362.63	4,000	do.	160,000
Do.	Jagna	24,115.26	3,000	do.	43,200
Do.	Loay	18,968.72	3,000	do.	144,000
Do.	Loboc	20,063.91	3,000	do.	61,900
Do.	Mabini	6,750.00	1,300	do.	72,000
Do.	Tagbilaran	13,837.47	5,245	Pumping	77,760
Do.	Tubigon	37,094.06	4,800	do.	100,800
Bukidnon	Delirio	(No data)	600	Gravity	4,320
Do.	Malaybalay	11,641.16	1,300	do.	20,160
Do.	San Luis	650.00	500	do.	
Bulacan	Hagonoy	7,564.87	2,789	do.	50,400
Do.	Malolos	131,179.20	6,000	Pumping	360,000
Do.	Marilao	22,101.50	Bath House.	Gravity	
Do.	Sibul, San Miguel.	256,000.00	Bath House.	do.	
Camarines Norte	Mambulao	1,200.00	1,823	do.	
Do.	Paracale	8,544.03	2,500	do.	100,800
Capiz	Capiz	13,541.92	6,400	Rain tank	264,170

[a] Projects completed in 1929.



DAVAO PIER AND APPROACH

TABLE B.—WATERWORKS PROJECTS COMPLETED—Continued

Province	Municipality	Cost	Population served	System	Capacity of system gallons per day
Cavite	Cavite	₱111,691.58	10,900	Pumping	200,000
Do.	Indang	39,627.40	3,000	do.	144,000
Do.	Mendez-Nuñez	60,700.00	1,600	do.	57,600
Do.	Silang	36,154.89	4,000	Gravity	100,000
Cebu	Alegria [a]	11,431.86	1,000	do.	43,200
Do.	Balamban	25,009.14	4,800	do.	72,200
Do.	Barili	26,958.28	2,067	do.	61,200
Do.	Carcar	64,004.45	4,463	do.	216,000
Do.	Catmon	16,399.56	1,624	do.	38,000
Do.	Cebu	526,000.00		do.	806,400
Do.	Cebu-Labangon	16,000.00	65,000	do.	576,000
Do.	Cebu-Sambag	35,789.18		Pumping	187,200
Do.	Cordova	4,810.74	1,191	Gravity	30,000
Do.	Daanbantayan	5,672.99	579	do.	30,000
Do.	Dalaguete	14,941.15	3,500	Pumping	36,000
Do.	Dalaguete Extension.	27,372.84		Gravity	57,600
Do.	Danao	42,055.89	2,500	do.	57,600
Do.	Dumanjug	35,638.29	1,500	Pumping	187,200
Do.	Ginatilan	13,404.80	2,669	Gravity	43,200
Do.	Mainit	2,000.00		do.	
Do.	Malabuyoc	14,941.15	1,500	do.	104,540
Do.	Moalboal	14,297.27	2,108	do.	54,720
Do.	Naga	6,800.00	3,233	do.	79,200
Do.	Naga Extension	4,552.48		do.	
Do.	Opon	36,568.44	1,500	Pumping	144,000
Do.	Pilar	5,019.21	702	Gravity	14,400
Do.	Poro	8,873.63	1,000	do.	21,600
Do.	Samboan	7,514.11	2,741	do.	49,250
Do.	San Isidro	1,388.13	650	do.	34,560
Do.	San Fernando	20,273.17	3,000	do.	108,000
Do.	San Francisco	6,200.00	1,243	do.	10,000
Cebu	Sibonga	₱35,300.00	2,661	Gravity	63,360
Do.	Bogod	13,221.44	2,200	do.	94,000
Do.	Tuburan	55,325.55	3,900	do.	120,960
Do.	Tudela	8,263.29	851	do.	24,480
Cotabato	Parang	9,600.00	600	Pumping	21,600
Davao	Davao	137,195.14	6,000	Gravity	86,400
Ilocos Norte	Badoc [a]	33,560.74	2,800	Pumping	108,000
Ilocos Sur	Santa [a]	19,930.19	875	Gravity	35,000
Do.	Bantay [a]	7,023.10	2,500	do.	201,600
Do.	Santa Catalina [a]	18,995.58	1,500	do.	
Do.	San Vicente [a]	23,450.50	2,000	do.	
Do.	Vigan	127,399.52	8,440	do.	
Iloilo	San Dionisio	11,483.82	1,500	do.	46,500
Isabela	Ilagan	(No record)		Rain tank	40,000
Laguna	Alaminos	28,496.85	1,130	Gravity	95,000
Do.	Bay	2,767.72	1,471	do.	86,400
Do.	Calamba	75,275.98	7,000	Pumping	288,000
Do.	Lilio	35,528.77	4,500	Gravity	316,800
Do.	Los Baños [a]	18,585.04	6,000	do.	288,000
Do.	Luisiana	50,708.07	4,500	do.	216,000
Do.	Lumban [a]	19,731.79	4,300	do.	107,000
Do.	Magdalena	68,549.54	3,000	do.	40,000
Do.	Majayjay	38,686.06	3,200	do.	187,200
Do.	Nagcarlang	36,034.42	2,500	do.	180,000
Do.	Paete	10,428.77	4,500	do.	216,000
Do.	Pagsanjan	73,782.67	4,044	Pumping	233,280
Do.	Rizal	26,777.56	3,000	Gravity	216,000
Do.	San Pablo	89,455.82	7,000	do.	576,000
Do.	Santa Cruz	92,692.43	6,000	Pumping	352,800
La Union	San Fernando	92,782.94	5,000	Gravity	300,000
Leyte	Baybay	72,889.23	8,000	do.	136,800
Do.	Liloan	7,483.63	700	do.	28,800

[a] Projects completed in 1929.

TABLE B.—WATERWORKS PROJECTS COMPLETED—Continued

Province	Municipality	Cost	Population served	System	Capacity of system gallons per day
Marinduque	Boac	₱6,653.00	1,000	Pumping	57,600
Do	Gasan	22,124.97	1,400	do	144,000
Do	Malbog	13,614.29	1,000	Gravity	61,920
Do	Mogpog	10,535.69	1,280	do	18,288
Do	Santa Cruz	20,696.23	2,560	do	158,400
Do	Torrijos	23,881.93	5,000	do	129,600
Mindoro	Abra de Ilog	4,743.74	350	do	14,400
Do	Bulalacao	3,232.08	700	do	43,200
Do	Calapan	29,743.47	2,500	Pumping	57,600
Misamis	Balingasag	8,924.14	1,514	Gravity	57,600
Do	Cagayan	50,408.82	3,000	Pumping	86,400
Do	Catarman [a]	18,862.22	4,000	Gravity	144,000
Do	Mahinog	6,000.00	5,727	do	....
Do	Mambajao	30,000.00	14,446	do	....
Do	Sagay	800.00	6,321	do	....
Do	Salay [a]	9,731.89	2,000	do	43,300
Mountain Province.	Baguio	229,605.89	6,000	Pumping and gravity.	350,000
Do	Cervantes	7,565.07	800	Gravity	....
Do	Itogon [a]	1,259.93	250	do	10,080
Do	Mansion House	2,144.58	100	Pumping	40,000
Do	Teachers' Camp	(No data)	1,500	do	216,000
Do	Trinidad Farm School.	19,330.93	300	Gravity	36,000
Do	Trinidad Stock Farm.	2,000.00	60	do	8,640
Nueva Ecija	Cabanatuan	111,302.49	6,000	Pumping	100,000
Do	Muñoz Agricultural School.	10,000.00	1,000	do	86,400
Oriental Negros	Bacong	27,210.48	1,800	Gravity	43,200
Do	Basac	(No data)	265	Pumping	....
Do	Dauin	22,296.01	1,500	Gravity	57,000
Do	Dumaguete	84,131.43	4,000	Pumping	288,000
Do	Guihulngan	21,096.31	3,500	Gravity	144,000
Do	Larena	(No data)	....	....	....
Do	Lazi	6,980.77	2,300	Gravity	....
Do	Libertad [a]	42,745.04	1,600	do	50,400
Do	Luzuriaga	12,317.44	2,500	do	269,200
Do	Maria	1,350.05	1,000	do	7,400
Do	Maria Extension	2,677.41			
Do	Siquijor	18,000.00	1,587	....	....
Do	Siquijor Extension.	(No data)	494	do	....
Do	Talingting	5,025.00	2,890	do	6,480
Do	Tanhay [a]	41,969.24	3,000	do	34,560
Do	Vallehermoso	17,390.14	2,500	do	115,200
Palawan	Coron	7,844.63	1,150	Pumping	20,160
Do	Puerto Princesa	10,268.45	716	do	28,800
Pampanga	Angeles	12,318.52	6,708	do	61,920
Do	Arayat	35,180.95	3,840	Gravity	144,000
Do	San Fernando	1,050.02	1,000	Pumping	86,400
Pangasinan	Alcala	3,000.00	2,200	Gravity	129,600
Do	Bani	12,411.86	2,000	do	86,400
Do	Bayambang	8,652.80	2,400	do	108,000
Do	Dagupan	2,823.02	Market	do	....
Do	Lingayen	3,938.99	do	do	....
Do	do	9,141.22	School	do	....
Do	do	96,682.22	7,000	Pumping	288,000
Do	Mangaldan	635.53	Market	Gravity	122,400
Do	San Fabian	682.87	do	do	57,600
Do	San Manuel	38,267.76	4,000	do	172,800
Rizal	Antipolo	23,299.07	2,250	Pumping	82,080
Do	Pasig	40,000.00	10,000	do	86,400
Do	Insular Asylum, San Felipe Neri.	13,881.86	1,200	do	120,000
Romblon	Cajidiocan [a]	4,844.21	1,000	do	8,640
Do	Looc	27,760.12	2,000	Gravity	144,000
Do	Romblon	(No data)	2,300	do	....
Samar	Calbayog	do	Market	do	20,000
Do	Catbalogan	64,308.94	2,000	do	55,000
Do	Oras	(No data)	4,000	do	....
Sorsogon	Bacon	21,000.00	3,200	do	79,200
Do	Gubat	76,998.62	7,000	do	288,000
Do	Magallanes	8,000.00	3,500	Pumping	....
Do	Sorsogon	70,701.49	6,000	Gravity	206,000
Do	do	1,044.67	250	Pumping	36,000
Sulu	Jolo	76,974.29	5,000	do	115,200
Surigao	Barrio Bacuag Gigaquit.	7,500.00	2,405	Gravity	....
Do	Lianga	1,924.58	1,290	do	2,880
Do	Placer	13,133.95	870	do	18,720
Tarlac	Moncada	32,122.26	3,000	do	86,400
Tayabas	Agdangan [a]	2,187.55	....	Rain tank	20,000
Do	Barrio Sangirin, Alabat [a].	2,070.55	....	do	20,000
Do	Candelaria	60,646.04	3,500	Gravity	216,000
Do	Calauag	4,931.75	....	Rain tank	40,000
Do	Guinayangan	16,073.26	1,500	Gravity	86,400
Do	Gumaca	4,482.17	1,600	Rain tank	40,000
Do	Infanta	4,424.55	1,200	do	40,000
Do	Lucban	50,205.60	3,200	Gravity	316,800
Do	Lucena	234,390.57	7,500	do	
Do	Lucena Improvement [a].	36,600.74	2,500	do	530,000
Do	Mauban	57,209.32	3,500	Pumping	144,000
Do	Mulanay	17,369.53	1,300	Gravity	180,000
Do	Pagbilao	70,538.47	2,300	do	54,700
Do	Pitogo	4,857.57	....	Rain tank	40,000
Do	Quezon	2,989.62	....	do	20,000
Do	Sampaloc	22,957.61	3,000	Gravity	129,600

[a] Projects completed in 1929.

Province	Municipality	Cost	Population served	System	Capacity of system gallons per day
Tayabas	San Narciso	₱14,297.61	1,000	Gravity	43,200
Do	Sariaya	37,935.00	6,000	do	201,600
Do	Tayabas	125,159.36	4,600	do	173,000
Do	Tiaong	49,694.74	1,800	do	187,200
Do	Unisan	4,490.89	....	Rain tank	40,000
Zambales	Subic	10,670.62	1,628	Gravity	11,520
Zamboanga	Zamboanga	305,561.30	5,000	do	504,000
Total	....	7,277,217.10	642,377	....	21,154,588

[a] Projects completed in 1929.

TABLE C.—WATERWORKS PROJECTS UNDER CONSIDERATION

Province	Municipality	Estimated cost	Population to be served	System
Abra	Peñarubia [a]	₱4,000.00	800	Gravity.
Albay	Calolbon [a]	36,000.00	5,000	Do.
Do	Libog	28,000.00	3,000	Do.
Do	Libon	244,000.00	3,000	Do.
Do	Polangui		8,000	Do.
Do	Malilipot [a]	33,000.00	3,000	Do.
Do	Tiwi	39,000.00	3,000	Do.
Antique	Dao	18,000.00	1,100	Do.
Do	San Jose Extension	40,000.00	1,500	Pumping.
Do	Tibiao	25,000.00	3,000	Gravity.
Bataan	Balañga [a]	69,000.00	5,500	Pumping.
Batanes	Ivana	50,000.00	2,000	Gravity.
Do	Uyugan		1,500	Do.
Batangas	Batangas	340,000.00		
Do	Bauan			
Do	Ibaan		2,700	Do.
Do	Lipa Improvement [a]	50,000.00	....	Do.
Do	Lipa Extension	7,000.00	....	Pumping.
Do	Lobo	12,000.00	1,000	Gravity.
Do	Rosario Extension [a]	22,000.00	....	Pumping.
Bohol	Anda Extension	20,000.00	3,000	Gravity.
Do	Albuquerque [a]	15,000.00	1,500	Do.
Do	Calape Extension	33,000.00	700	Do.
Do	Carmen	6,100.00	600	Do.
Do	Clarin	24,000.00	1,000	Do.
Do	Cortes [a]	32,000.00	1,500	Pumping.
Do	Corella	6,000.00	1,000	Gravity.
Do	Garcia-Hernandez	31,600.00	2,000	Do.
Do	Inabanga Extension	19,000.00	1,000	Do.
Do	Lila	6,000.00	700	Do.
Do	Maribojoc [a]	45,000.00	4,000	Do.
Do	Panglao [a]	27,000.00	900	Do.
Bukidnon	Impasugong	36,000.00	1,600	Do.
Bulacan	Baliuag	120,000.00	8,000	Pumping.
Do	Obando	75,000.00	5,000	Do.
Do	Pulilan	18,000.00	3,000	Gravity.
Do	San Ildefonso	45,000.00	2,500	Pumping.
Do	Santa Maria	40,000.00	3,000	Do.
Cagayan	Aparri	346,000.00	9,200	Do.
Do	Camalaniugan		2,350	Do.
Do	Lallo		1,400	Do.
Camarines Sur	Iriga	70,000.00	10,000	Do.
Do	Lagonoy	42,000.00	4,000	Gravity.
Do	Camarines Sur Agricultural School, Pili [a].	15,000.00	300	Do.
Capiz	Capiz Metropolitan [a]	480,000.00	15,000	Do.
Do	Dumalag	60,000.00	5,000	Do.
Cebu	Alegria Extension	13,000.00	1,500	Do.
Do	Asturias	27,000.00	1,100	Pumping.
Do	Argao	39,000.00	4,500	Gravity.
Do	Badian	30,000.00	1,700	Do.
Do	Bantayan	50,000.00	4,000	Pumping.
Do	Barili Extension	8,600.00	300	Gravity.
Do	Cebu Leprosarium	90,000.00	800	Pumping.
Do	Consolacion		1,200	
Do	Mandaue		4,500	
Do	Dumanjug Improvement	32,000.00	3,200	Gravity.
Do	Cebu Extension to Mandaue.	35,000.00	....	Do.
Do	Oslob	15,000.00	2,000	Do.
Do	Ronda	30,000.00	1,900	Do.
Do	San Francisco Improvement.	27,000.00	....	Do.
Do	Talisay	30,000.00	2,000	Do.
Cotabato	Cotabato	62,000.00	1,250	Pumping.
Do	Cotabato	100,000.00	4,000	Gravity.
Davao	Davao Improvement	200,000.00	4,000	Do.
Ilocos Sur	Masingal	63,000.00	4,000	Do.
Do	Narvacan	55,000.00	3,000	Do.
Do	San Esteban	9,000.00	1,500	Do.
Iloilo	Ajuy	8,000.00	1,100	Do.
Isabela	Ilagan [a]	126,000.00	5,500	Do.
Laguna	Calauan	42,000.00	3,000	Do.
Do	Lilio Extension	27,500.00	2,500	Do.
Do	Pila [a]	42,000.00	2,000	Pumping.
Lanao	Dansalan [a]	22,000.00	1,300	Do.
Do	Iligan	42,000.00	4,000	Gravity.
La Union	Agoo	24,000.00	1,500	Do.
Do	Bauang [a]	61,000.00	2,500	Do.

[a] Projects for which design and estimate were made during 1929.

TABLE C.—WATERWORKS PROJECTS UNDER CONSIDERATION—Continued

Province	Municipality	Estimated cost	Population to be served	System
La Union	Naguilian	₱39,000.00	2,500	Do.
Do.	San Fernando Extension	3,600.00	....	Do.
Leyte	Barrio San Ricardo, Pintuyan.	2,500.00	800	Do.
Do.	Calubian [a]	4,000.00	800	Do.
Do.	Leyte Metropolitan	680,000.00	23,500	Do.
Do.	Maasin	30,000.00	3,300	Do.
Do.	Sogod [a]	12,300.00	2,000	Do.
Marinduque	Boac Capitol Building	6,500.00	500	Pumping.
Mindoro	Pola [a]	21,500.00	2,000	Gravity.
Misamis	Jasaan	20,000.00	2,500	Do.
Do.	Jimenez	30,000.00	4,000	Do.
Do.	Misamis	66,000.00	3,450	Pumping.
Do.	Talisayan	27,000.00	2,800	Gravity.
Nueva Ecija	San Jose	60,000.00	5,000	Pumping.
Occidental Negros	Silay	416,000.00	6,000	Gravity.
Do.	Sumag		1,300	
Do.	Talisay		6,000	
Do.	Pinucatan	2,300.00	....	Gravity.
Oriental Negros	Bais	36,000.00	3,000	Do.
Do.	Barrio Bolos	9,000.00	1,100	Do.
Do.	Jimalalud [a]	21,000.00	1,700	Do.
Do.	Luzuriaga Extension	8,500.00	650	Do.
Do.	San Juan	21,000.00	2,000	Do.
Do.	Tayasan	22,500.00	2,500	Do.
Do.	Zamboanguita	50,000.00	3,000	Do.
Palawan	Concepcion	3,600.00	600	Do.
Do.	Coron Improvement	13,000.00	600	Do.
Pampanga	Angeles	₱80,000.00	8,000	Gravity.
Do.	Magalang [a]	45,000.00	2,500	Do.
Pangasinan	Dagupan [a]	63,000.00	4,000	Pumping.
Do.	Malasiqui [a]	57,000.00	2,600	Do.
Do.	Rosales [a]	63,000.00	3,000	Do.
Do.	San Carlos [a]	90,000.00	4,500	Do.
Do.	Urdaneta	1,800.00	....	Gravity.
Rizal	Pasig Extension	27,000.00	5,200	Pumping.
Samar	Calbayog–Oquendo	250,000.00	7,000	Gravity.
Do.	Llorente	14,000.00	2,500	Pumping.
Do.	Oras Improvement	10,000.00	3,500	Gravity.
Sorsogon	Barcelona	25,500.00	4,000	Do.
Do.	Bulan	105,000.00	9,000	Do.
Do.	Casiguran	70,000.00	5,000	Do.
Do.	Casiguran	114,000.00	5,000	Do.
Do.	Juban		5,000	Do.
Do.	Magallanes [a]	48,000.00	5,000	Do.
Do.	Matnog	16,000.00	2,500	Do.
Do.	Prieto–Diaz [a]	30,000.00	2,000	Do.
Surigao	Surigao	48,000.00	4,000	Do.
Tarlac	Tarlac	135,000.00	6,000	Pumping.
Do.	Tarlac Extension	4,000.00	1,000	Do.
Tayabas	Baler [a]	55,000.00	2,500	Gravity.
Do.	Calauag [a]	84,000.00	6,000	Do.
Do.	Catanauan	40,000.00	4,000	Do.
Do.	Tayabas Extension	20,000.00	1,200	Do.
Total		7,039.400.00	387,800	

[a] Projects for which design and estimate were made during 1929.

APPENDIX

ACTIVE PROJECTS, JANUARY 1, 1929

Provinces	Roads and trails			Bridges and culverts			Provincial capitols			Presidencias		Prisons			Schools		Markets and tiendas		Hospitals			Miscellaneous buildings			Water systems			Electric light plants			Artesian wells			Port works			Miscellaneous projects							
	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Wireless stations	Surveys and investigations	gation systems	r control	ncial or mun.	ents	ified	
Abra	9	5	1												11	1						1			1			1										[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Agusan	5	1	1												2							3		1										1				1			[illegible]	[illegible]	[illegible]	[illegible]
Albay	14	6								2					7							6			3	2								1				4	2		[illegible]	[illegible]	[illegible]	[illegible]
Antique	3	2							1		2				5				1						5																[illegible]	[illegible]	[illegible]	[illegible]
Bataan	3	3		1											1											1												2				[illegible]	[illegible]	[illegible]
Batanes	1	8						1							3							7			1									1	2		1					1	4	[illegible]
Batangas	9	7		1				1			1				11		1					2	3		4	1												1	1			1		44
Baguio	3	4									1				1		1					2			1			1													1		17	32
Benguet	4	9								2						1			2			7																					19	44
Bohol	6	3									1				1	1	4						1		4	1									2									24
Bukidnon	2	3													1			1				3																						10
Bulacan	3	3	1				1				1				1				1			4			4	5				1	1							1						27
Cagayan	5	3													10	1						2			1										1			1					3	27
Camarines Norte	4	4	1			1				1					7	1						1																1						21
Camarines Sur	11	4							1	2	1				4	2	1			1		2	2	1	2							20						2					2	58
Capiz	12	2								2					11		1		1					1	1										1			1						33
Cavite	11	8		3						4					12		1					1		1	2													5						48
Cebu	11	4	4	3			1								22	1	1		1			2		3	7	1	1							1			1		1	1				65
Cotabato	5	12		1											1	1		1				2	3	2	1													3	1	1		1	4	41
Davao	5	4		1			1								4	2			1	1		3	1	1										2	1		1	3				1	4	36
Ilocos Norte	9	4									1				3	1						1			1									2										22
Ilocos Sur	5	7		2	1				1		1				3						1	1			7							3						1					2	35
Iloilo	15	4		1			1		1	3					7		2					1		2	4	1								3	2			3		1			13	64
Isabela	5	2								2	1				8							1		2																	2	1	3	27
Laguna	7	5													3							2																1						18
Lanao	4	3	1								2											6	3		1							2		1		1	1	1	1				2	29
La Union	8	14		5	2			1							9	2	1						2		2													2	1				3	53
Leyte	18	3	2												2										5										2		1	1						34
Manila																			4	6		10	63	1											4								199	287
Marinduque	5	3								2					5							1																						16
Masbate	3	2		3						1					5		1					2			3							1						1						22
Mindoro	4	3						1							3							1	1												1	1		1						16
Misamis	6	5						1		1					6					1		10	1			1									2			1					1	36
Mountain Province	1	9						1		1						1		1		1		2	3		2																			22
Nueva Ecija	17	9		4			1	1			1				2	7	2					2	3		1	1												6					2	59
Nueva Vizcaya	1	5								1	1				4	1				1		1			1													1		1			3	21
Occidental Negros	19	4		3			1			2					8		2					7			5												1	1				1	1	55
Oriental Negros	7	5													6		3					1			3									1	3								1	30
Palawan	2	2													10	1						2	7			1								1				1						27
Pampanga	2	4					1								2																							1					1	11
Pangasinan	10	5		1					1	3					5	1	3					6	2		1													2	4				2	46
Rizal	14	5					1								7		2						2								1							2				1	2	37
Romblon	4	1													9										3													3		1				21
Samar	16	3								1					12							3	1		5	1		1						1	3		2	5					1	55
Sorsogon	5	3	1								1					3			1				1	1															1				1	18
Sulu	4	3	1							3												4	6												2		4	1					3	31
Surigao	3	2													4	1							1												1		1	1						14
Tarlac	2	3		1						1					1							2																2					2	14
Tayabas	12	7	1	1						1					6	1	2					10	5		12	1								3			2	3		1			7	75
Zambales	4	2		1						1					7								4																				1	20
Zamboanga	8	6																	1			5	2					1						2	1		3	1					6	36
Total	346	228	13	33	3	1	8	8	4	36	15	..	..	..	251	30	28	3	13	11	1	130	117	16	93	17	1	4	...	1	2	26	..	20	28	2	18	67	12	6	2	8	315	1918

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

(Corrected to January 1, 1930)

A. D. WILLIAMS, *Director of Public Works*
MARCIAL KASILAG, *Chief Constructing Engineer*
J. C. COOKINGHAM, *Chief Designing Engineer*
NICANOR CORTES, *Chief Irrigation Engineer*
J. M. ARELLANO, *Acting Consulting Architect*
R. REINOSO, *Chief, Administrative Division*

CENTRAL OFFICE ORGANIZATION

DESIGNING DIVISION

A. T. Sylvester, Port Works Engineer.
L. L. Vincent, Supervising E. and M. E.
Juan Piedad, C. E.
Domingo Guanio, C. E.
Eliodoro Segui, C. E.
Ross Hagler. Principal Engineering Aid.
Manuel I. Felizardo, E. and M. E.
Alejandro J. Villanueva, C. E.
Ciriaco Coronel, E. and M. E.
Anastasio Pasos, M. E.
Cosme J. Ventura, E. E.
Vicente Villanueva, Asst. E. E.
Pablo Ilagan, Asst. E. E.
Arsenio P. Luna, Asst. C. E.
Marcos Amponin, Asst. M. E.
Domingo de la Paz, Asst. C. E.
io P. Ylo, Asst. C. E.
or Ruelos, Asst. C. E.
Palma, Structural Draftsman.
Molina, Structural Draftsman.

DIVISION OF ARCHITECTURE

Cheri Mandelbaum, Architect.
Antonio Toledo, Supervising Architect.
Teodato P. Macabulos, Designing Engineer.
Juan O. Altiveros, Architect.
Aurelio N. Cobangbang, Civil Engineer.
Gregorio Alcantara, Civil Engineer.
Angel Pascual, Civil Engineer.
Ephraim Gochangco, Asst. Civil Engineer.
Nicolas R. Jimenez, Asst. Civil Engineer.
Antonio M. Paterno, Asst. Civil Engineer.
Benedicto B. Padilla, Asst. Civil Engineer.

CONSTRUCTING DIVISION

V. Fragante, Highway Engineer.
E. D. Smith, Division Engineer.
Luis Francisco, Division Engineer.
Fidel V. Larracas, Division Engineer.
Dalmacio Urtula, Division Engineer.
B. C. Guerrero, Chief Locating Engineer.
L. T. Clark, C. E., Constructing Engineer.
V. Fernandez Lavadia, C. E.
Jose Wright, C. E., Superintendent, Maintenance, Alteration and Repair.
Juan T. Villanueva, Asst. M. E.
Ramon Madrigal, Asst. C. E.
Hermenegildo Reyes, Asst. C. E.
Mariano Lacandola, Asst. C. E. Spl. Duty.
V. M. Ninobla, Asst. C. E., Spl. Duty.

IRRIGATION DIVISION

W. J. Lamon, Project Engineer.
H. O. Bauman, Project Engineer.
Hilario S. Clemente, Designing Engineer.
Gregorio de Leon, Designing Engineer.
Jacinto Gochoco, Chief Hydrographer.
Gonzalo Garcia, Project Engineer.
Graciano J. Militante, Project Engineer.
Faustino Salvador, Actg. Project Engineer.
Fernando Arnaldo, Superintendent, Aganan River and Santa Barbara Irrigation Systems.
Alfredo G. Eugenio, Superintendent, San Miguel and O'Donnell River Irrigation Systems.
Ramon C. Caluya, Superintendent, Tagudin, and Amburayan River Irrigation Systems.
Manuel Gonzales, Civil Engineer.
Julian A. Buendia, Civil Engineer.
Crisostomo Almajose, Civil Engineer.

IRRIGATION DIVISION—Cont.

Procopio F. Eleazar, Civil Engineer.
Felipe R. Jimenez, Civil Engineer.
Jose O. Lahoz, Civil Engineer.
Vicente R. Cruz, Civil Engineer.
Filemon C. Rodriguez, Asst. Civil Engineer.
Servando Suguitan, Assistant Civil Engineer.
Agapito Alano, Assistant Civil Engineer.
Albert L. Morrow, Assistant Civil Engineer.
Eleuterio Macalalag, Assistant Civil Engineer.
Andres O. Hizon, Assistant Civil Engineer.
Antonio A. Villanueva, Asst. C. E.
Filemon Zablan, Assistant Civil Engineer.
Tomas T. Zita, Assistant Civil Engineer.
Jose C. Velasquez, Assistant Civil Engineer.
Wilfred Demers, Supervising Hydrographer.
Arturo Pancho, Hydrographer.
Roberto P. Villaluya, Hydrographer.
Antonio Baldonado, District Hydrographer.
Francisco Aquino, Assistant Hydrographer.
Manuel V. Trani, Assistant Hydrographer.
Lorenzo Ylarde, Assistant Hydrographer.
Arturo Elizaga, Assistant Hydrographer.
Tranquilino Mendoza, Assistant Hydrographer.
Emilio Perez, Jr. Hydrographer.
Bonifacio Ramos, Jr. Hydrographer.
Mauro Yambao, Jr. Hydrographer.
Artemio Abaya, Chief Water Rights Inspector.
Mariano N. Leones, Supervising Surveyor.
Eliseo Panopio, Surveyor.
Vitaliano Villavicencio, Water Right Inspector.
Isidoro Villo, Water Right Inspector.
Francisco S. Villanueva, Water Right Inspector.
Pedro Valderrama, Water Right Inspector.

DISTRICT ORGANIZATION

F. J. Halsema, D. E., Baguio, Benguet.
Irineo M. Santos, C. E., Baguio, Benguet.
B. T. Saldaña, Asst. C. E., Baguio, Benguet.
E. D. Smith, Division Engineer, First Division, Manila.
Bernabe Gregorio, D. E., Abra.
Fil de Peralta, Acting D. E., Bataan.
Jose Cruz, Asst. C. E., Bataan.
Saturnino Lopez, D. E., Bulacan.
Dominador M. Cruz, Asst. C. E. Bulacan.
Pedro Olympia, Asst. C. E., Bulacan.
Manuel Diaz, Acting D. E., Cagayan-Batanes.
Bartolome Puzon, C. E., Cagayan.
Martin Pulido, Asst. C. E., Cagayan.
Julian Yandoc, Asst. C. E., Cagayan.
Manuel Feliciano, Asst. C. E., Batanes.
Leon Ines, D. E., Ilocos Norte.
Jose S. Alejandrino, Asst. C. E., Ilocos Norte.
Vicente Abaya, Asst. C. E., Ilocos Norte.
Julio A. Reyes, In charge of Office, Ilocos Sur.
Felino Brillantes, Asst. C. E., Ilocos Sur.
Jaime Laguardia, Acting D. E. Isabela.
Catalino Guillermo, Asst. C. E., Isabela.
Tomas de Guzman, Asst. C. E., Isabela.
Gaudioso Cruel, D. E., La Union.
Severino D. Pineda, Asst. C. E., La Union.
Zacarias Sadueste, Asst. C. E., La Union.
Roque Peredo, Acting D. E., Mt. Province.
F. de la Fuente, Asst. C. E, Mt. Province.
D. L. Pablo, Asst. C. E., Mt. Province.
Vicente Orosa, Acting D. E., Nueva Ecija.
Tomas Lorenzo, Asst. C. E., Nueva Ecija.
Antonio J. Zarate, Asst. C. E., Nueva Ecija.
Marcial T. Lagunzad, Asst. C. E., Nueva Ecija.
V. Oledan, Acting, D. E., Nueva Vizcaya.
Carlos Salcedo, Asst. C. E., Nueva Vizcaya.
Isabelo Lagniton, D. E., Pampanga.
Luis Novenario, Asst. C. E., Pampanga.
Bonifacio Eusebio, Asst. C. E., Pampanga.
Rafael Contreras, Asst. C. E., Pampanga.
Librado Vizcarra, Asst. C. E., Pampanga.
Arturo P. Nitorreda, D. E., Pangasinan.
E. de los Santos, Asst. C. E., Pangasinan.
Bonifacio Villanueva, Surveyor, Pangasinan.
Rosalio Villalon, D. E., Tarlac.
Lorenzo J. Samonte, Asst. C. E., Tarlac.
Carlos Amoranto, Asst. C. E., Tarlac.
Rufino Pimentel, Acting D. E., Zambales.
Arsenio V. Caluya, Asst. C. E., Zambales.
Luis Francisco, Division Engineer, Second Division, Manila.
Venancio Gloria, D. E., Albay.
Mariano D. Rico, Asst. C. E., Albay.
Dominador Ermitaño, Asst. C. E., Albay.
Esteban Manzanero, Asst. C. E., Albay.
Jose Virtucio, Asst. C. E., Albay.
Amando Mirasol, Asst. M. & Elec. E., Albay.
Isaias Fernando, D. E., Batangas.
Gregorio Matanguihan. Asst. C. E., Batangas.
Francisco Santana, Asst. C. E., Batangas.
G. E. Imperial, D. E., Camarines Norte.
Fidel S. Manio, Asst. C. E., Camarines Norte.
A. R. Soriano, Asst. C. E., Camarines Norte.
Homobono H. Gonzales, D. E., Camarines Sur.
Carlos Leaño, Asst. C. E., Camarines Sur.
H. Carpio, Asst. C. E., Camarines Sur.
Pedro Lorenzo, Surveyor, Camarines Sur.
Rafael Ungson, Acting D. E., Cavite.
Jesus Cordero, Asst. C. E., Cavite.
Martin Resplandor, Jr. C. E., Cavite.
Fernando E. V. Sison, Acting D. E., Laguna.
Jose Villaroel, Asst. C. E., Laguna.
Edilberto Evidente, Asst. C. E., Laguna.
Miguel P. Taña, Asst. C. E., Laguna.
Conrado Gomez, Asst. C. E., Laguna.
Agapito G. Tuason, Asst. M. E., Laguna.
Eladio M. Santos, D. E., Marinduque
Carlos de Leon, Asst. C. E., Marinduque.
Francisco Katigbak, D. E., Masbate.
Aurelio M. Jover, Asst. C. E., Masbate.
Mario Bundalian, Asst. C. E., Masbate.
Silvestre Tan Chauco, Acting D. E., Mindoro.
Pio Mendoza, Asst. C. E., Mindoro.
Francisco Alvarez. Acting D. E., Rizal.
Jose Preysler, Asst. C. E., Rizal.
Simeon Alfonso, Asst. C. E., Rizal.
Sergio Bayan, Acting D. E., Sorsogon.
Jose Morelos, Asst. C. E., Sorsogon.
Esteban Hipolito, Asst. C. E., Sorsogon.
Antonino A. Fajardo D. E., Tayabas.
Santiago C. Magbuhat, Asst. C. E., Tayabas.
Alfonso Ungson, Asst. C. E., Tayabas.
Ponciano Bernardo, Asst. C. E., Tayabas.
Alejandro G. Paraiso, Asst. C. E., Tayabas.
Fidel V. Larracas, Division Engineer, Third Division, Manila.
Gil Mallare, Acting D. E., Antique.
Emilio Buenaventura, Acting D. E., Bohol.
Pedro Formilleza, Asst. C. E., Bohol.
Claro Trota, Asst. C. E., Bohol.
Hospicio I. Fernandez, D. E., Capiz.
Florentino Segovia, Asst. C. E., Capiz.
Jose M. Panganiban, Asst. C. E., Capiz.
H. C. Garretson, D. E., Cebu.
Lorenzo Ortiz, C. E., Cebu.
Francisco Fabros, Asst. C. E., Cebu.
Antonio Aseniero, Asst. C. E., Cebu.
Jose Chavarria, Asst. C. E., Cebu.
Alberto Bautista, Asst. C. E., Cebu.
Juan G. Peralta, Asst. M. E., Cebu.
Alejo Aquino, D. E., Iloilo.
Manuel V. Zabat, C. E., Iloilo.
Jose Tomacruz, Asst. C. E., Iloilo.
Eduardo Blanco, Asst. C. E., Iloilo.
Irineo G. Crisanto, Asst. C. E., Iloilo.
Joaquin L. Panis, In Charge of office, Leyte.
Pedro M. Lladoc, Asst. C. E., Leyte.
Marcelino Samson, Asst. C. E., Leyte.
Luciano Galimpin,, Asst. C. E., Leyte.
Severino Fernandez, D. E., Occidental Negros.
Jose Gandionco, Asst. C. E., Occidental Negros.
R. E. Fernandez, Asst. C. E., Occ. Negros.
Catalino Paraiso, Asst. C. E., Occ. Negros.
Deogracias Estrella, Asst. C. E., Occ. Negros.
A. Osmeña, Acting D. E., Oriental Negros.
Pacifico Pinili, Asst. C. E., Oriental Negros.
Antonio Piñero, Asst. C. E., Oriental Negros.
Juan Paraiso, Acting D. E., Palawan.
Rodolfo Maslog, Asst. C. E., Palawan.
Jose Serapio, Asst. C. E., Palawan.
Filomeno Picson, Acting D. E., Romblon.
Felicisimo Ople, Asst. C. E., Romblon.
Pastor Avisado, Acting D. E., Samar.
Arturo M. Gonzalez, Asst. C. E., Samar.
Galo C. Castronuevo, Asst. C. E., Samar.
F. Zulueta, Asst. C. E., Spl. Duty. Samar.
Luis Sirilan, Asst. C. E., Samar.
Ciriaco P. Rama, Surveyor, Samar.
Dalmacio Urtula, Division Engineer, Fourth Division, Manila.
Jose Ignacio, Acting D. E., Agusan.
Rufino Garcia, Acting D. E., Cotabato.
Mariano Flores, Asst. C. E., Cotabato.
Mariano Dy Reyes, Asst. C. E., Cotabato.
Vicente Purugganan, Asst. C. E., Cotabato.
Andres Villegas, Asst. C. E., Cotabato.
Alfonso Oboza, Acting D. E., Davao.
Jose Viacrucis, Asst. C. E., Davao.
Jacobo Tagorda, Asst. C. E., Davao.
Alejandro Rivera, D. E., Lanao.
Teodoro R. Mocorro, Asst. C. E., Lanao.
Nicolas L. Cuenca, D. E., Misamis.
Dionisio Escobar, Asst. C. E., Misamis.
Bonifacio Salas, Asst. C. E., Misamis.
Antonio D. Reyes, Asst. C. E., Misamis.
Jose Follosco, Project Engineer, Jimenez.
W. J. Hollis, Acting D. E., Sulu.
Aquiles Gonzales, Asst. C. E., Sulu.
Miguel Y. Garcia, D. E., Surigao.
Jose Lozada, D. E., Zamboanga.
Leandro Espejo, C. E., Zamboanga.
M. T. Tubungbanua, Asst. C. E., Zamboanga.
Segundo Gloria, Asst. C. E., Zamboanga.
Florentino Pontiveros, Asst. C. E., Zamboanga.
Antonio Ignacio, Asst. C. E., Zamboanga.

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THE BUREAU OF PUBLIC WORKS

DEPARTMENT OF COMMERCE AND COMMUNICATIONS · PHILIPPINE ISLANDS ·

BULLETIN

Vol. 19 JANUARY 1, 1931 No. 1

268158

THE LIBRARY, UNIVERSITY OF THE PHILIPPINES, MANILA

CONVERSION TABLE

One peso (₱) = 50 cents, U. S. currency.
One kilometer (km.) = 0.62 mile.
One kilogram (kg.) = 2.20 pounds (lbs.).
One centimeter (cm.) = 0.39 inch.
One meter (m.) = 3.28 feet.
One hectare (ha.) = 2.47 acres.
One cubic meter (cu. m.) = 1.31 cubic yards.
One hectare meter per day = 8.107 acre feet per day.
One liter per second (second liter) = 0.0353 cubic foot per second (cu. sec.) second feet.

MANILA
BUREAU OF PRINTING
1932

ANNUAL REPORT OF THE BUREAU OF PUBLIC WORKS FOR THE YEAR 1930

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF COMMERCE AND COMMUNICATIONS
BUREAU OF PUBLIC WORKS

LETTER OF SUBMITTAL

MANILA, *March 28, 1931*

SIR:

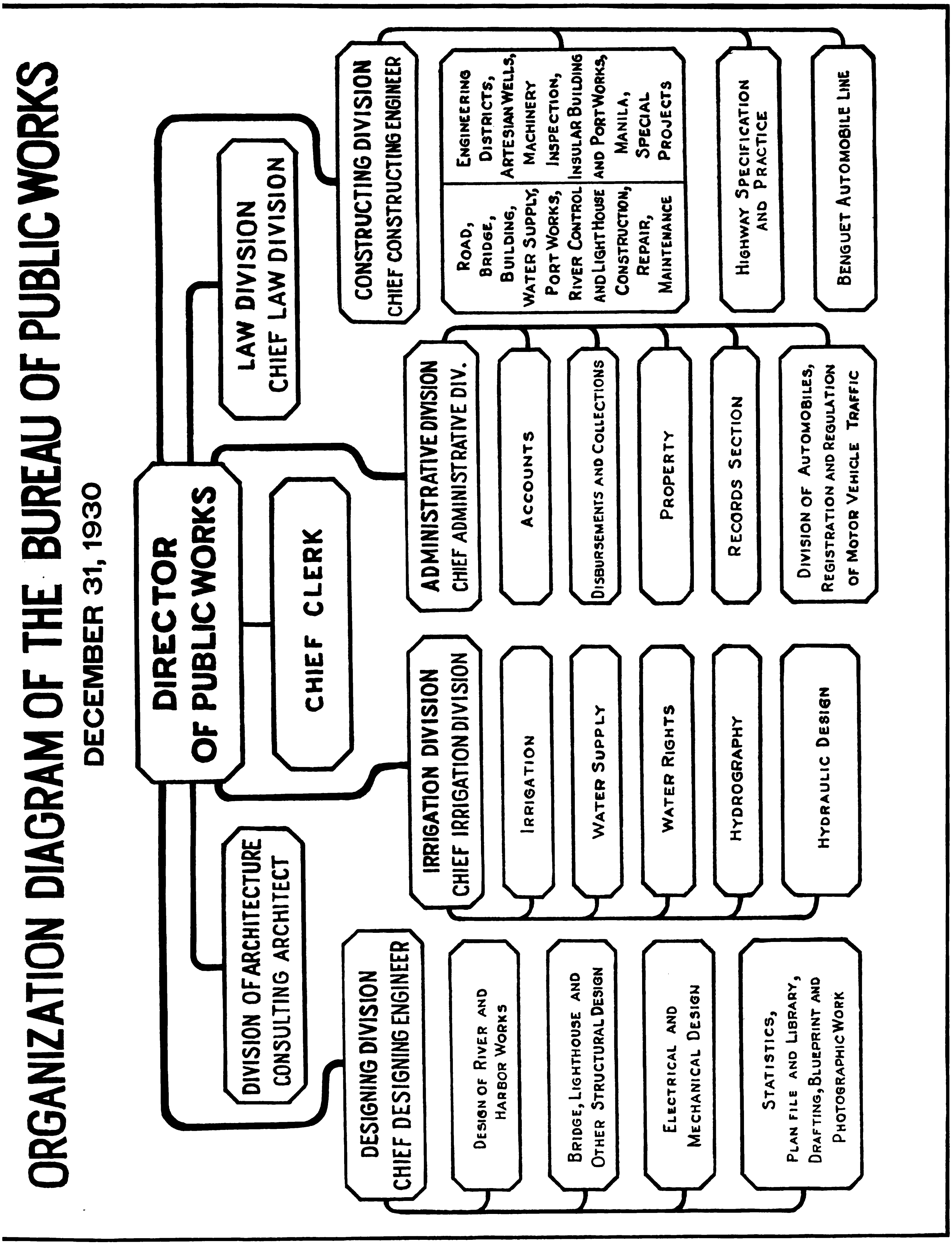
I have the honor to submit herewith the annual report of the Bureau of Public Works for the year ending December 31, 1930.

Mr. J. C. Cookingham, Chief Designing Engineer, acted as Director from September 6, 1930 until the end of the year while the undersigned was absent from the Islands attending the International Road Congress held at Washington during the month of October, and on leave.

Very respectfully,

A. D. WILLIAMS
Director of Public Works

The Honorable,
The SECRETARY OF COMMERCE AND COMMUNICATIONS,
Manila, P. I.



ORGANIZATION DIAGRAM OF THE BUREAU OF PUBLIC WORKS

DECEMBER 31, 1930

DIRECTOR OF PUBLIC WORKS
CHIEF CLERK
LAW DIVISION
CHIEF LAW DIVISION
DIVISION OF ARCHITECTURE
CONSULTING ARCHITECT
CONSTRUCTING DIVISION
CHIEF CONSTRUCTING ENGINEER
ROAD, BRIDGE, BUILDING, WATER SUPPLY, PORT WORKS, RIVER CONTROL AND LIGHTHOUSE CONSTRUCTION, REPAIR, MAINTENANCE
ENGINEERING DISTRICTS, ARTESIAN WELLS, MACHINERY INSPECTION, INSULAR BUILDING AND PORT WORKS, MANILA, SPECIAL PROJECTS
HIGHWAY SPECIFICATION AND PRACTICE
BENGUET AUTOMOBILE LINE
ADMINISTRATIVE DIVISION
CHIEF ADMINISTRATIVE DIV.
ACCOUNTS
DISBURSEMENTS AND COLLECTIONS
PROPERTY
RECORDS SECTION
DIVISION OF AUTOMOBILES, REGISTRATION AND REGULATION OF MOTOR VEHICLE TRAFFIC
IRRIGATION DIVISION
CHIEF IRRIGATION DIVISION
IRRIGATION
WATER SUPPLY
WATER RIGHTS
HYDROGRAPHY
HYDRAULIC DESIGN
DESIGNING DIVISION
CHIEF DESIGNING ENGINEER
DESIGN OF RIVER AND HARBOR WORKS
BRIDGE, LIGHTHOUSE AND OTHER STRUCTURAL DESIGN
ELECTRICAL AND MECHANICAL DESIGN
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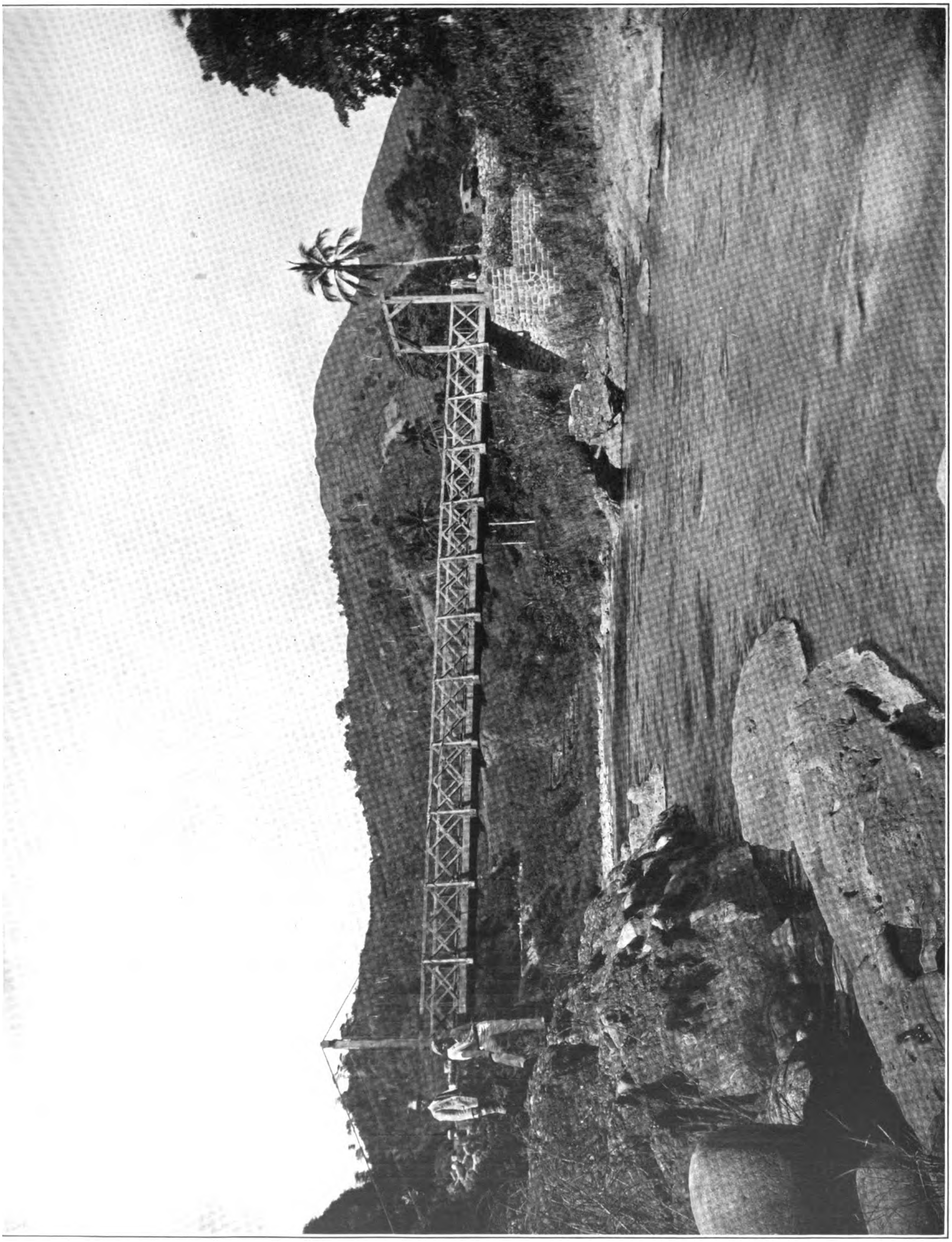


MUNGAYAN BRIDGE, MOUNTAIN PROVINCE

THE BUREAU OF PUBLIC WORKS BULLETIN

MANILA, P. I.

PUBLISHED UNDER THE DIRECTION OF THE

DIRECTOR OF PUBLIC WORKS

ORGANIZATION AND PERSONNEL

The present organization and principal functions of the Bureau of Public Works are shown in the organization diagram on page 4. The Philippine Islands are now divided into forty-nine (49) engineering districts which, with the exception of a separate district for the City of Manila, are coextensive with provincial limits. The district engineer is the local representative of the Bureau in each district and is responsible for all activities, excepting the larger irrigation projects, which are constructed by project engineers under the direct supervision of the Manila Office. The General Office in Manila prepares plans and specifications for construction projects and exercises general supervision over all activities of the Bureau.

PERSONNEL

Number of employees paid direct from Bureau and Project funds as of December 31, 1930: Americans: 18, Filipinos: 570

[NOTE.—The corresponding figures for December 31, 1929, are Americans 13 and Filipinos 540, respectively.]

Number of technical employees as of December 31, 1930: Americans 9, Filipinos 228.

[NOTE.—The corresponding figures for December 31, 1929, are 10 and 225, respectively.]

AMERICAN TECHNICAL EMPLOYEES

Position	Permanent	Temporary	Total
Civil engineer	6	0	6
Electrical and mechanical engineer	1	0	1
Surveyor	1	0	1
Architect	1	0	1
Total	9	0	9

FILIPINO TECHNICAL EMPLOYEES

Position	Permanent	Temporary	Total
Civil engineer	64	15	79
Assistant civil engineer	105	15	120
Junior civil engineer	2	0	2
Electrical engineer	2	0	2
Mechanical engineer	2	0	2
Mechanical-electrical engineer	2	0	2
Assistant mechanical engineer	7	0	7
Assistant electrical engineer	2	0	2
Junior mechanical engineer	0	1	1
Junior electrical engineer	0	1	1
Surveyor	5	0	5
Junior surveyor	2	0	2
Supervising architect	1	0	1
Architect	2	0	2
Total	196	32	228

CHANGES IN PERSONNEL

The figures in the following tabulation include all officers and employees under civil service appointment (permanent and temporary) and engaged upon work supervised by the Bureau of Public Works by whatever branch of the Government paid:

Changes	Americans	Filipinos	Total 1929	Total 1928
Number of appointments	1	191	192	244
Number of transfers to the Bureau	0	23	23	11
Number of separations for cause	0	8	8	18
Number of voluntary resignation	0	80	80	86
Number of transfers from Bureaus	0	17	17	10
Number of retirement	0	0	0	8
Number of separations, expiration of employment	0	18	18	9
Number of deaths	0	3	3	8

NOTE.—Item "Number of appointments" includes new and probational appointments.

EXPENDITURES SUPERVISED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 TO DECEMBER 31, 1929 AND 1930

Items	Insular expenditures				Provincial and municipal expenditures		Fund from private sources		Total	
	Bureau of Public Works		Appropriations controlled by other Bureaus							
	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930
	Pesos	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*	*Pesos*
Roads, bridges and ferries	129,001.01	97,551.99	24,773.83	76,761.67	15,524,554.93	14,859,046.29	682.75	153.01	15,679,012.52	15,033,512.96
Telegraph, telephone and cable lines and radiographs	443,500.00	350,000.00			7,470.64	17,291.12			450,970.64	367,291.12
Buildings	672,192.66	835,032.04	188,516.08	115,044.13	3,993,932.22	4,465,331.68		840.76	4,854,640.96	5,416,248.61
Wireless station buildings including towers and masts	170,000.00			468.83					170,000.00	468.83
Maintenance, alteration and repair of public buildings	422,362.82	341,203.93	1,265.06		213,572.15	152,592.29			637,200.03	493,796.22
River and harbor works (including lighthouses, buoys, and beacons)	1,484,469.53	2,176,676.92	1,422,281.78	2,529,991.36	68,240.34	42,209.57		1,308.84	2,974,991.65	4,750,186.69
Artesian wells and water supply	202,599.12	188,644.50	9,945.61	1,867.83	1,489,018.71	1,236,176.13	7,738.94	12,875.10	1,709,302.88	1,439,563.56
Irrigation projects	114,748.47	94,295.21	891,049.10	502,699.80		210.67	184,709.55	40,056.85	1,190,507.12	637,262.53
Benguet automobile line	211,629.80	43,626.18							211,629.80	43,626.18
Registration and regulation of motor vehicle traffic	154,500.00	158,308.18							154,500.00	158,308.18
Los Baños quarry	120,000.00	129,505.43							120,000.00	129,505.43
Board of examiners for engineers and architects	3,800.00	3,724.96							3,800.00	3,724.96
Regulation, safeguarding of traffic and collection of tolls on Kennon and Naguilian Roads	13,500.00	13,487.06							13,500.00	13,487.06
Dwellings and equipment for rent in Baguio	49,600.00	38,814.16							49,600.00	38,814.16
Permanent Bridges Revolving Fund		210,294.78								210,294.78
Miscellaneous			212,744.19	225,885.05	326,812.73	254,622.70	4,618.54	4,584.12	544,175.46	485,091.87
Totals	4,191,903.41	4,681,165.34	2,750,575.65	3,452,718.67	21,623,601.72	21,027,480.45	197,749.78	59,818.68	28,763,830.56	29,221,183.14

BALANCE SHEET, BUREAU OF PUBLIC WORKS

GENERAL FUND

Assets	1929	1930	Liabilities	1929	1930
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱1,654,357.86	₱3,501,167.31	Accounts payable	₱4,559,853.05	₱4,603,467.02
Cash, collecting and disbursing officer	2,145,342.58	2,307,233.17	Accrued leave payable	239,298.82	263,305.31
Accounts receivable	3,202,919.67	2,473,260.24	Undistributed collection	53,773.28	30,216.26
Supplies and materials	516,769.38	404,469.60	Deferred credit to income	17,452.94	7,603.84
Prepayments	507.82	42.00	Insurance reserve	1,651.48	1,759.30
Works in process	1,803.32	1,832.06	Construction of buildings, etc	608,652.70	2,057,063.08
			Maintenance, alteration, and repair of public buildings	143,297.01	102,093.08
			Irrigation systems	27,756.45	22,461.24
			Artesian wells and waterworks	63,479.80	26,015.66
			Harbor and river improvement	1,294,059.73	1,151,115.36
			Roads and bridges	15,415.87	7,863.88
			Telephone, telegraph, cable, etc	350,000.00	345,000.00
Total current assets	7,521,700.63	8,688,004.38	Lighthouse, buoys, and beacons	147,009.50	70,040.35
FIXED PROPERTY:			Total current liabilities	7,521,700.63	8,688,004.38
Real property and improvements	52,085,392.26	54,240,034.06			
Equipment	4,075,196.99	3,698,532.74	PRINCIPAL ACCOUNT SURPLUS:		
(Less depreciation)	(1,241,606.53)	(1,241,306.53)	Fixed property investment	54,919,282.72	56,697,260.27
Total assets	62,440,983.35	65,385,264.65	Total liabilities	62,440,983.35	65,385,264.65

III—MOTOR VEHICLE SPECIAL FUND

CURRENT:			CURRENT:		
Cash, collecting and disbursing officers	₱3,231.17	₱23,578.37	Accounts payable	₱53,624.29	₱98,466.41
Cash (deposit), Insular Treasury	475,060.62	394,698.46	Accrued leave payable	11,190.80	12,944.45
Accounts receivable	1,461.74	10,168.35	Undistributed collections	190,913.31	26,907.87
Supplies and materials	142.60	123.10	Deferred credit to income	186.87	13,246.88
Prepayments	17,089.08	16,531.48	Unappropriated surplus	236,069.84	293,534.15
			Roads and bridges	5,000.00	....
Total current assets	496,985.11	445,099.76	Total current liabilities	496,985.11	445,099.76
FIXED PROPERTY:					
Equipment	20,584.07	25,389.91	PRINCIPAL ACCOUNTS SURPLUS:		
(Less depreciation)	(3,327.28)	(3,327.28)	Fixed property investment	17,256.79	22,062.63
Total assets	514,241.90	467,162.39	Total liabilities	514,241.90	467,162.39

IV—FIDUCIARY FUND

CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱24,399.69	₱18,322.87	Guarantee fund	₱21,685.30	₱19,712.75
Cash, collecting and disbursing officers	(1,160.00)	1,723.00	Civil Service trust fund	1,554.39	333.12
Total current assets	23,239.69	20,045.87	Total current liabilities	23,239.69	20,045.87

V—HIGHWAY SPECIAL FUND

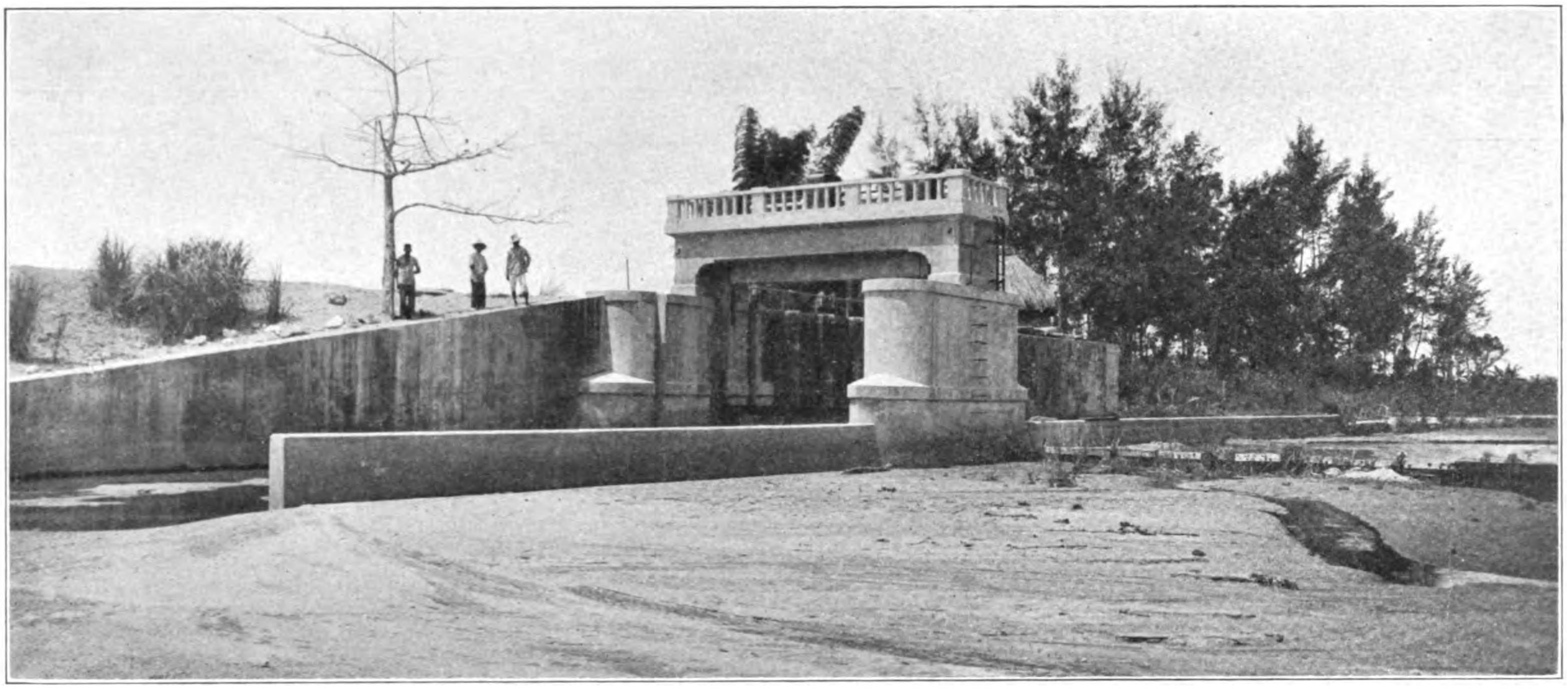
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱189,317.32	₱1,242,733.54	Unappropriated surplus	₱189,317.32	₱1,232,733.54
			Accounts payable	....	10,000.00
Total assets	189,317.32	1,242,733.54	Total liabilities	189,317.32	1,242,733.54

VI—BAGUIO DWELLINGS AND EQUIPMENT FOR RENT

CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱60,414.03	₱71,480.48	Accounts payable	₱18,000.08	₱18,729.84
Cash, collecting and disbursing officers	10,022.93	8,178.14	Accrued leave payable	204.35	238.45
Accounts receivable	2,630.16	2,277.84	Undistributed collections	182.67	28.09
			Deferred credit	944.52	941.59
			Insurance reserve	80.28	80.28
			Unappropriated surplus	53,655.22	61,918.18
Total current assets	73,067.12	81,936.43	Total current liabilities	73,067.12	81,936.43
FIXED PROPERTY:					
Real property and improvements	627,185.92	627,185.92	PRINCIPAL ACCOUNTS SURPLUS:		
Equipment	148,808.80	146,628.96	Fixed property investments	723,005.09	720,795.25
(Less depreciation)	(52,989.63)	(52,989.63)			
Total assets	796,072.21	802,731.68	Total liabilities	796,072.21	802,731.68

VII—BENGUET AUTO LINE

CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱158,639.38	₱214,975.37	Accounts payable	₱113,814.32	₱65,840.77
Cash, collecting and disbursing officers	33,997.82	22,662.36	Accrued leave payable	2,142.56	....
Accounts receivable	24,041.10	113,107.82	Undistributed collections	2,868.69	268.79
Supplies and materials	45,212.66	....	Insurance reserve	6,098.27	6,098.27
			Unappropriated surplus	136,966.62	278,537.72
Total current assets	261,890.96	350,745.55	Total current liabilities	261,890.96	350,745.55
FIXED PROPERTY:			PRINCIPAL ACCOUNTS SURPLUS:		
Real property and improvements	7,700.00	....	Fixed property investment	141,366.38	....
Equipment	232,902.61	....			
(Less depreciation)	(99,236.23)	....			
Total assets	403,257.34	350,745.55	Total liabilities	403,257.34	350,745.55



O'DONNELL RIVER IRRIGATION SYSTEM HEADWORKS, TARLAC PROVINCE

BALANCE SHEET, BUREAU OF PUBLIC WORKS—Continued

VIII—IRRIGATION INSURANCE FUND

Assets	1929	1930	Liabilities	1929	1930
CURRENT:			CURRENT:		
Cash (deposit), Insular Treasury	₱171,072.78	₱439,555.39	Accounts payable	₱64,026.34	₱14,533.77
Cash, collecting and disbursing officers	10,486.33	(114,270.08)	Accrued leave payable	44.42	44.45
Accounts receivable	53,601.65	57,927.61	Undistributed collections	165,192.22	329,279.45
			Tagudin Irrigation System	100.08	
Supplies and materials	105.24		Unappropriated surplus	5,902.94	39,355.28
Total assets	235,266.00	383,212.92	Total liabilities	235,266.00	383,212.92

IX—MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS

CURRENT:			CURRENT:		
Cash, collecting and disbursing officers	₱39,996.63	₱47,831.98	Accounts payable	₱966.63	₱1,306.41
Cash (overdraft), Insular Treasury	(584,281.50)	(706,156.61)	Accrued leave payable	2,721.92	4,036.13
Accounts receivable	552,849.00	731,993.34	Undistributed collections	2,682.11	46,140.44
Supplies and materials	1,090.00	267.95	Unappropriated surplus	3,283.47	22,453.68
Total current assets	9,654.13	73,936.66	Total current liabilities	9,654.13	73,936.66
FIXED PROPERTY:			PRINCIPAL ACCOUNT SURPLUS:		
Real property and improvements	12,291.49	12,291.49	Fixed property investment	12,663.28	14,672.75
Equipment	371.79	2,381.26			
Total assets	22,317.41	88,609.41	Total liabilities	22,317.41	88,609.41

X—LOS BAÑOS QUARRY, ACT 3459

CURRENT:			CURRENT:		
Cash, collecting and disbursing officers	₱2,492.66	₱3,559.80	Accounts payable	₱21,341.50	₱45,053.89
Cas (deposit), Insular Treasury	112,851.53	139,608.85	Accrued leave payable	537.54	12.74
Accounts receivable	43,578.05	38,812.84	Unappropriated surplus	138,677.47	136,608.14
Supplies and materials	1,634.27	(306.72)			
Total current assets	160,556.41	181,674.77	Total current liabilities	160,556.51	181,674.77
FIXED PROPERTY:			PRINCIPAL ACCOUNTS SURPLUS:		
Real property and improvements	27,873.92	58,841.09	Fixed property investment	48,554.76	76,869.76
Equipment	24,484.26	21,832.09			
(Less depreciation)	(3,803.42)	(3,803.42)			
Total assets	209,111.27	258,544.53	Total liabilities	209,111.27	258,544.53

XI—PERMANENT BRIDGE REVOLVING FUND, ACT 3500

CURRENT:			CURRENT:		
Cash, collecting and disbursing officers		₱1,710,225.22	Accounts payable		₱18,926.85
Cash (deposit), Insular Treasury		3,098,715.47	Accrued leave payable		308.64
			Unappropriated surplus		4,789,705.22
Total current assets		4,808,940.69	Total current liabilities		4,808,940.69
FIXED PROPERTY:			PRINCIPAL ACCOUNT SURPLUS:		
Real property and improvements		210,294.78	Fixed property investment		210,294.78
Total assets		5,019,235.47	Total liabilities		5,019,235.47

BALANCE SHEET, BUREAU OF PUBLIC WORKS—Continued

STATEMENT OF APPROPRIATION, INCOME AND EXPENSES

Debit	1929	1930	Credit	1929	1930
Reversion of unexpended balances of administrative appropriation	₱981.29	₱822.78	Appropriation of administrative expenses of Bureau of Public Works (expenditures partially offset by surcharge collected)	₱949,732.00	₱950,700.00
Reversion of receipts	1,258,585.06	1,310,926.74	Receipts—prime cost	6,136,681.95	7,563,349.05
Operating expenditures offset by receipts	6,136,681.95	7,563,349.05	Receipts—surcharges	1,163,902.50	1,170,974.14
Expenditures, administrative appropriation	944,538.71	945,203.77	Receipts—miscellaneous	21,607.37	118,851.49
Outlays, purchase of equipment	4,212.00	4,673.45	Gain on supplies sold	1,052.65	1,222.43
			Inventory adjustments	10,037.78	(37,517.80)
			Income from rentals	25,277.48	15,986.66
			Sales of fixed assets	469.79	3,843.79
			Prior year's credit	36,237.49	37,566.03
Total debit	8,344.999.01	9,824,975.79	Total credit	8,344,999.01	9,824,975.79

OPERATION STATEMENT

Operating revenue	1929	1930	Operating expenses	1929	1930
Rental	₱25,277.48	₱15,986.66	Supervising, technical, and electrical services (salaries)	₱787,256.00	₱786,386.51
			Labor	46,454.00	43,398.00
Surcharges	1,163,902.50	1,170,974.14	Consumption of supplies and materials	40,690.00	39,683.56
			Rental of buildings	19,999.92	19,999.92
Gain on goods sold	1,052.65	1,222.43	Ilumination and power service	9,000.00	8,662.04
			Traveling expenses of personnel	21,000.00	24,494.03
Inventory adjustments	10,037.78	(37,517.80)	Repair service	4,500.00	3,928.99
			Postal, telegraph, telephone and cable service	9,320.00	9,290.32
Sales of fixed assets	469.79	3,843.79	Other expenses	11,530.79	14,033.85
Other service income	21,607.37	118,851.49	Total operating expenses	949,750.71	949,877.22
Prior year	36,237.49	37,568.03	Operating profit	308,834.35	361,049.52
Total	1,258,585.06	1,310,926.74	Total	1,258,585.06	1,310,926.74

SPECIAL APPROPRIATIONS

Name of activity	Appropriation		Expenditures		Reversion of appropriation		Income	
	1929	1930	1929	1930	1929	1930	1929	1930
1. Registration and regulation of Motor vehicles	₱154,500.00	₱159,080.00	₱154,500.00	₱158,308.18	....	₱771.82	₱1,341,364.17	₱2,015,772.49
2. Regulation and safeguarding of traffic and collection of tolls	13,500.00	15,500.00	13,500.00	13,407.06	....	12.94	50,302.75	46,910.52
3. Benguet automobile line	211,629.80	188,597.50	211,629.80	43,626.18	....	144,971.32	173,521.25	185,197.28
4. Los Baños Quarry	120,000.00	139,400.00	120,000.00	129,505.43	....	9,894.57	138,577.47	127,436.10
5. Board of Examiners for Engineers and Architects	3,800.00	3,800.00	3,800.00	3,724.96	....	75.04	3,680.00	4,930.00
6. Baguio dwellings and equipment for rent	49,600.00	31,700.00	49,600.00	38,814.16	....	2,885.84	46,206.17	47,077.12
Totals	553,029.80	546,077.50	553,029.80	387,465.97	....	158,611.53	1,753,751.81	2,427,323.51

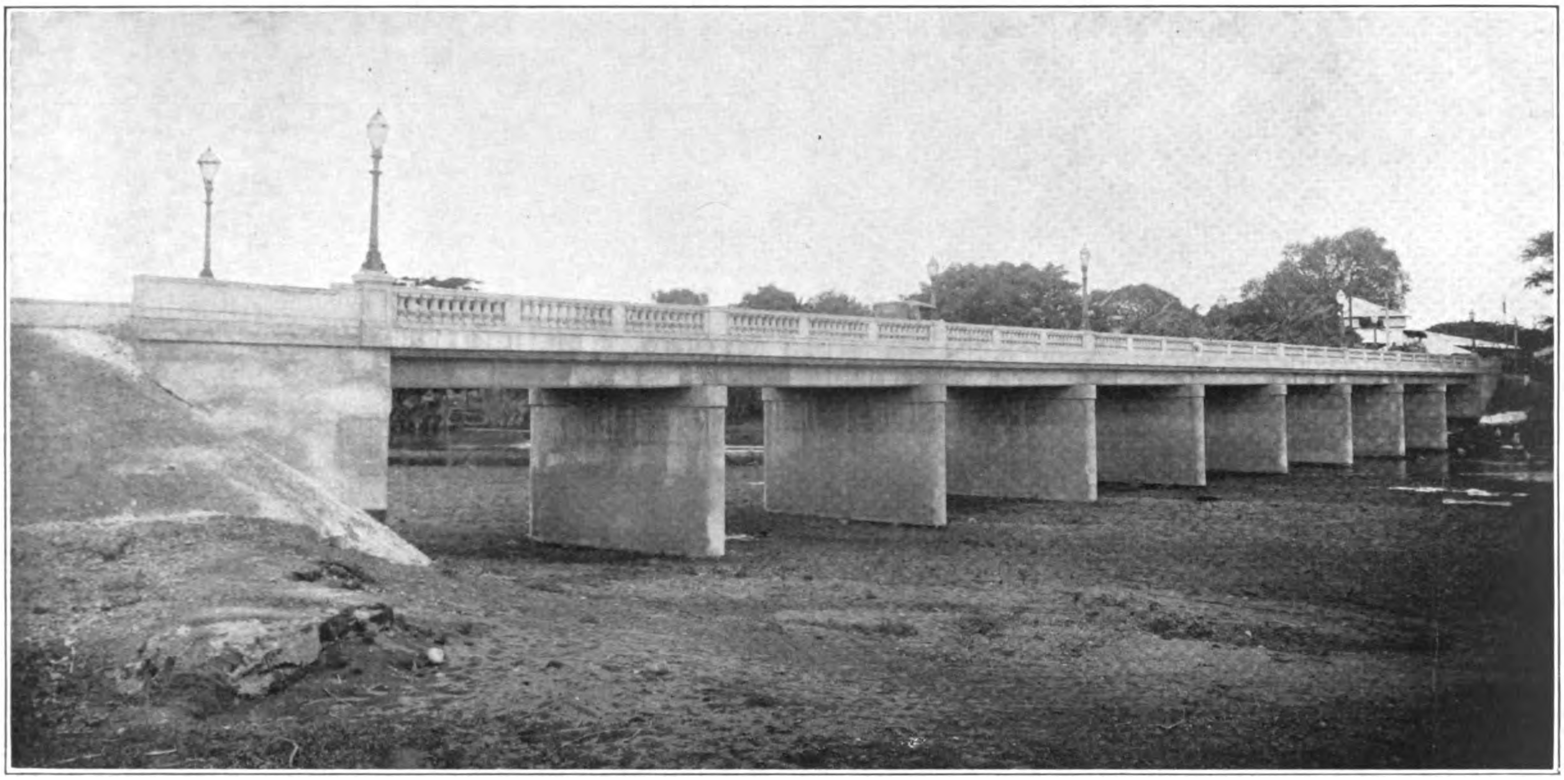
TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) FROM JANUARY 1 TO DECEMBER 31, 1930

GENERAL FUND

Assets	1929	1930	Liabilities	1929	1930
3. Interbureau transfer	₱477,277.34	₱3,956.50	Principal account surplus from previous year	₱54,566,421.76	₱54,919,282.72
7. Sales	461.61	3,843.23	1. Purchase	17,207.41	470,977.48
5. Voluntary contributions	38,322.32	332,568.37	2. Construction	1,257,020.37	1,700,350.21
8. Losses (covered by affidavits)	10,942.12	2,118.91	3. Interbureau transfer	....	18,584.15
9. Depreciation accruals (including assets dropped on Inventory and Inspection Reports	....	....	4. Found at station	8,281.79	456,250.32
9-1. Depreciation on ordinary equipment	54,527.04	484,256.48			
9-2. Depreciation on artesian well equipment	52,469.24	10,934.30			
9-3. Depreciation on automobiles and steam wagons	23,431.20	8,778.15			
9-4. Depreciation on port works equipment	252,115.36	....			
10. Transfers to provinces and municipalities	8,102.86	1,858.92			
11. Inventory adjustment	11,999.52	14,869.75			
Principal account surplus	54,919,282.72	56,697,260.27			
Total	55,848,931.33	57,560,444.88	Total	55,848,931.33	57,560,444.88

III—MOTOR VEHICLE SPECIAL FUND

3. Interbureau transfer	₱13,365.37	....	Principal account surplus from previous year	₱19,780.77	₱17,256.79
9-1. Depreciation on ordinary equipment	75.25	....			
9-3. Depreciation on automobiles and steam wagons	1,599.99	₱34.13			
Principal account surplus	17,256.79	22,062.63	1. Purchase	12,516.63	4,839.97
Total debits	32,297.40	22,096.76		32,297.40	22,096.76



TALISAY RIVER BRIDGE, BATAAN

TRANSACTIONS AFFECTING PRINCIPAL ACCOUNT SURPLUS (FIXED ASSETS) FROM JANUARY 1 TO DECEMBER 31, 1930—Continued

VI—BAGUIO DWELLINGS AND EQUIPMENT

Assets	1929	1930	Liabilities	1929	1930
3. Interbureau transfer		₱95.69	Principal account surplus from previous year	₱716,485.94	₱723,005.09
7. Sales	₱94.86	265.08	1. Purchase	7,000.00	3,750.47
8. Losses (covered by affidavits)	80.28	76.23	4. Found at station	539.74	
9-1. Depreciation on ordinary equipment	845.95	5,226.12			
10. Transfer to municipalities and provinces		296.19			
Principal account surplus	728,005.09	720,795.25			
Total debits	724,025.68	726,755.56		724,025.68	726,755.56

VII—BENGUET AUTO LINE

Assets	1929	1930	Liabilities	1929	1930
3. Interbureau transfer		₱5,858.75	Principal account surplus from previous year	₱154,078.81	₱141,866.38
6. Insurance fund replacement	₱6,000.00		1. Purchase	37,962.50	
7. Sales	709.78	103,064.63	Accrued depreciation ordinary equipment		300.55
8. Losses (covered by affidavits)	98.27		Accrued depreciation auto and steam wagons		98,935.68
9. Depreciation accruals (including assets dropped on Inventory and Inspection Report)		94,418.78	2. Construction	9,500.00	
9-1. Depreciation on ordinary equipment	14,354.37	852.95			
9-3. Depreciation on automobiles and steam wagons	44,359.25				
10. Transfers to provinces and municipalities	666.69				
11. Inventory adjustment		36,412.55			
Principal account surplus	141,366.38		4. Found at station	6,013.43	
Total debits	207,554.74	240,602.61		207,554.74	240,602.61

IX—MAINTENANCE AND OPERATION OF IRRIGATION SYSTEMS

Assets	1929	1930	Liabilities	1929	1930
3. Interbureau transfer		₱78.99	Principal account surplus from previous year	₱337.37	₱12,663.28
			1. Purchase		2,009.47
			3. Interbureau transfer	78.99	
			4. Found at station	12,246.92	
Principal account surplus	₱12,663.28	14,672.75	11. Inventory adjustment		78.99
Total debits	12,663.28	14,751.74		12,663.28	14,751.74

X—LOS BAÑOS QUARRY, ACT 3459

Assets	1929	1930	Liabilities	1929	1930
9-1. Depreciation on ordinary equipment	₱3,873.42		Principal account surplus from previous year		₱48,554.76
			1. Purchase	₱6,000.00	8,445.95
			2. Construction	5,200.00	19,700.00
			3. Interbureau transfer	41,158.18	
Principal account surplus	48,554.75	₱76,869.76	4. Found at station		169.05
	52,358.18	76,869.76		52,358.18	76,869.76

XI—PERMANENT RIVER BRIDGE REVOLVING FUND

Assets	1929	1930	Liabilities	1929	1930
9-1. Depreciation on ordinary equipment			1. Purchase		
Principal account surplus		₱210,294.78	2. Construction		₱210,294.78
		210,294.78			210,294.78

Manila–South Road, Laguna–Tayabas Boundary

THE LARGER RESULTS OF THE YEAR'S WORK

Surfaced roads constructed and designated first class..	Kms.....	526.5
Reinforced concrete bridges and culverts completed, (in this figure, concrete pipe culverts are not included)	Number	61
Successful deep wells completed	do	61
Reinforced concrete buildings completed (including only buildings of over 100 cu. m. capacity)	do	162
Insular Irrigation systems completed	do	1
Waterworks projects completed (total population served, 63,680)	do	[a] 29

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[a] Includes two improvements and one extension.

EXPENDITURES SUPERVISED DURING THE YEAR 1930 AS COMPARED WITH THE YEAR 1929

Items	1929	1930
Total expenditures	₱28,768,830.56	₱29,221,183.14
Total expended upon road and bridge work	15,679,012.52	15,033,512.96
Total expended upon building work	5,661,840.99	5,910,518.66
Total expended upon port works	2,974,991.65	4,750,186.69
Total expended upon water supply	1,709,302.38	1,439,568.56
Total expended upon irrigation projects	1,190,507.12	637,262.53
Operation of automobile line, quarries, and the supervision of motor vehicle traffic	499,629.80	344,926.85
Permanent bridges revolving fund	....	210,294.78
Expenditures on miscellaneous items account for the balance	1,048,546.10	894,922.11

REGISTRATION AND REGULATION OF MOTOR VEHICLES

During the year ending December 31, 1930, there were 37,667 motor vehicles registered, as compared with 32,280 during 1929. During this same period 22,332 student permits were issued and 57,344 operators of motor vehicles were duly licensed.

The following is a comparative tabulation of motor vehicles registered during the years 1929 and 1930:

Vehicles	1929	1930
Automobiles	21,341	22,899
Motor trucks	10,365	14,380
Motorcycles	574	388
Total	32,280	37,667

The campaign for the apprehension of violators of the Motor Vehicle Law was carried out vigorously thru the aid of the Constabulary traffic officers with the result that there were 3,836 licenses suspended and 221 revoked as compared with 3,717 licenses suspended and 247 revoked during 1929. The results of the campaign are as follows:

	Total number of cases reported		Cases for reckless driving		Cases for speeding	
	1929	1930	Number	Per cent	Number	Per cent
First quarter	1,782	2,200	352	16.00	325	14.77
Second quarter	2,651	2,112	471	22.30	339	16.00
Third quarter	2,026	3,148	497	15.82	454	14.42
Fourth quarter	2,931	3,108	382	12.29	378	12.16
Total	9,890	10,568	1,702	16.61	1,492	14.33

	1929	1930
Number of deaths caused by automobile accidents reported during the year	50	76
Number of licenses suspended during the year	3,717	3,836
Number of licenses revoked during the year	247	221
Amount of fines imposed in violation of Automobile Law	₱17,005.84	₱17,224.25

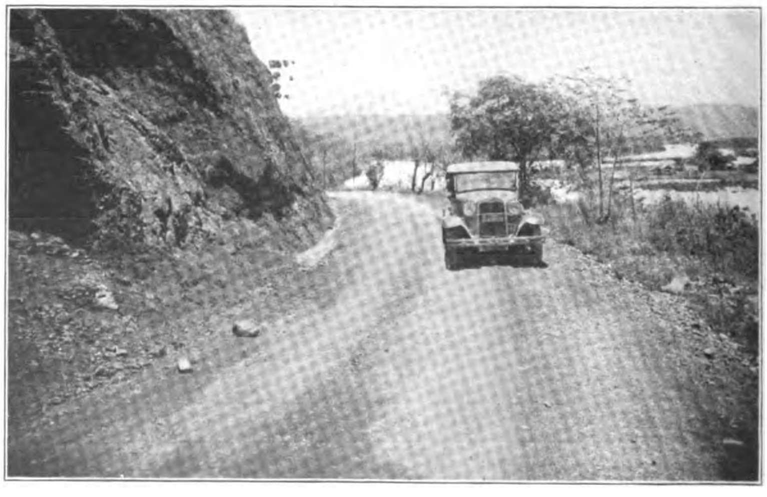
Provisions of the Automobile Law (Act 3045) commonly violated:

	1929	1930
Section 20 (*a*), overloading	1,848	1,963
Section 26 (*b*), reckless driving	1,606	1,702
Section 26 (*a*), speeding	1,441	1,492
Section 2 (*a*), "colorum"	658	953
Section 34, lights	500	633
Section 14 (*h*), driving without license	265	257

COLLECTIONS AND EXPENDITURES

The following tabulation shows the yearly amount of funds collected and expended for the registration and regulation of motor vehicles from 1912 to 1930:

Year	Collections	Expenditures
1912	₱13,469.00	₱3,930.70
1913	19,392.66	19,630.72
1914	16,335.00	15,874.74
1915	20,305.00	16,233.28
1916	37,561.97	9,041.95
1917	62,002.19	18,414.31
1918	84,243.74	81,051.79
1919	113,909.11	70,000.00
1920	177,263.24	75,000.00
1921	207,275.53	64,000.00
1922	518,825.85	47,774.93
1923	628,918.54	60,000.00
1924	633,214.36	50,000.00
1925	798,438.62	63,025.55
1926	985,561.28	62,555.55
1927	1,145,369.34	83,040.00
1928	1,254,684.81	103,040.00
1929	1,341,364.17	154,500.00
1930	2,015,772.49	159,080.00



Subic–Olongapo Road, Zambales

BENGUET AUTOMOBILE LINE

The Benguet Auto Line operated during the period January 1 to March 15, 1930 (Benguet Auto Line transferred to Manila Railroad Co., March 16, 1930) seven passenger trucks, eight freight trucks and fourteen special cars; and handled 1,329 and 67 half-rate first-class passengers; 1,796 and 32 half-rate third-class passengers; 598,803 kilos of express and freight; 763 pieces of hand baggage, and 8,265 kilos of dead head express and freight.

By virtue of Act 3638, the Benguet Automobile Line including its certificate of public convenience, good will and properties existing on the date of transfer (March 15, 1931) was sold to the Manila Railroad Company for the sum of ₱140,000. The other assets consisting of cash and accounts receivable will remain the property of the Government, the Bureau of Public Works assuming all the obligations of the Benguet Auto Line, existing on the date of transfer.

The total gross income of the line corresponding to the period from January 1 to March 15, 1930 amounted to ₱82,132.65. This amount consisted of receipts from operation, ₱39,168.70; prior year's receipts taken up in 1930 account, ₱42,716.01; and other service income, ₱247.94. The total operating expenditures for the same period amounted to ₱43,626.80. This included the cost of deterioration of supplies and sales of stocks in the amount of ₱17,694.47.

BAGUIO COTTAGES AND APARTMENTS

The Insular Government cottages and apartments (formerly office buildings) were leased to Government employees and private parties in accordance with the regulations governing same, approved under date of January 31, 1929. As in the previous year there was a great demand for these accommodations in 1930.

The total income from rental of cottages and apartments during the year amounted to ₱47,139.29 as against ₱49,594.89 during 1929. The cost of maintaining and operating same was ₱27,895.43 in 1930, as compared with ₱32,621.84 expended in the previous year. The unusually large number of visitors from China and Singapore who occupied cottages in Baguio during the months of July and August, 1929, accounts for the increased revenue realized during that year.

Slight improvements were made on Cottages Nos, 19, 20 and 26. Hot water connections were installed in Cottages Nos, 2, 9, 10, 19, 20, 28 and 41. All the small cottages were provided with sanitary closets.

LOS BAÑOS QUARRY

Los Baños Quarry was operated at a net profit of ₱15,795.02 as compared with ₱19,150.25 for the previous year. A new office building and new magazine were constructed to replace the old buildings which, after over twenty years of service, had become too dilapidated for further use. The construction of a retaining wall and additional storage bins was undertaken at an estimated cost of ₱12,000. This work, when completed, will increase the storage capacity of the plant and enable the quarry to fill orders received at the beginning of the road building season without serious delay.

Elementary School, Pagsanjan, Laguna

Camarines Norte–Camarines Sur Road

CONSTRUCTING DIVISION

MARCIAL KASILAG, *Chief Constructing Engineer*

In spite of the prevailing financial depression, the year 1930 proved to be a generous year for road and bridge work. The total appropriation provided for this work amounted to ₱18,074,308.37 as compared with ₱16,421,181.82 for the year 1929. Of this sum, ₱8,144,454.01 were derived from general taxation (Provincial Road and Bridge Funds); ₱1,800,000 from collections under Act 3045 (Motor Vehicle Law); ₱4,000,000 from collection under Act 3248 (Gasoline Tax Law); ₱2,812,000 from insular appropriations under Act 3670, and ₱1,317,854.36 from Act 3500 (Revolving Fund of Five Million Pesos for the construction of permanent bridges in the Philippines). The collection under Act 3045 was increased by ₱600,000 over that of the previous year. The decrease of ₱513,000 in the insular appropriations under Act 3670 was more than covered by the amount of ₱1,317,854.36 appropriated under Act 3500. Of the ₱4,000,000 under Act 3248, ₱1,000,000 were released late in November and ₱1,000,000 were recommended for distribution in December, but not released before the end of the year, hence ₱2,000,000 remained unexpended at the close of the year. Construction work was completed on 526.5 kilometers of first-class roads, 135.8 kilometers of second-class roads, and 102.7 kilometers of third-class roads, making a total of 13,405.5 kilometers of first-, second- and third-class roads on December 31, 1930. Improved roads of all classes were maintained at a total cost of ₱7,304,293.34, the average being ₱818.05 per kilometer for first-class roads and ₱264.20 per kilometer for second- and third-class roads.

Of the more important permanent bridges that were under construction during the year, ten were completed with an aggregate span of 563.15 meters at a total cost of ₱592,953.85.

A total of 38.6 kilometers of old water bound macadam road were treated with asphalt by the penetration method, and 433.4 kilometers were surface painted. The funds for this work were largely taken from insular allotments made to provinces under Acts 3045 and 3248. Wherever asphalt has been used, the maintenance cost has been decreased to approximately 50 per cent of the cost of maintaining the old water bound macadam roads. This very satisfactory result is encouraging provincial authorities to make an effort to finance the construction of asphalt pavements on all roads subjected to heavy traffic, but the lack of adequate funds continues to be a serious handicap in carrying out this work in a systematic manner. The policy heretofore followed of first asphalting sections of important roads through towns and barrios in order to eliminate the dust nuisance has been adhered to.

Considerable improvements were made on roads carrying heavy traffic in order to make them safe for the traveling public. By-pass roads around towns to relieve traffic congestion and split roadways on sharp curves to prevent accidents were constructed on many heavy traffic roads.

The following table shows the sources of funds provided for road and bridge purposes, the amounts expended for maintenance and construction, the cost of road maintenance in each province, and the average cost of maintaining the different classes of roads during the year:

TABLE I.—FUNDS FOR ROAD AND BRIDGE CONSTRUCTION AND MAINTENANCE

Year	General taxation (Provincial road and bridge funds)	Act 3045 (Automobile registration and licence fees)	Insular appropriation	Act 3248, levying a special tax on motor spirits	Act 3500 (Revolving fund)	Total
1922	₱4,469,555.00	₱518,825.85	₱3,245,000.00			₱8,233,380.00
1923	3,999,751.00	628,918.54	2,380,000.00			7,008,674.54
1924	4,826,878.00	633,214.36	2,400,000.00			7,860,092.36
1925	4,406,320.00	798,438.62	2,517,327.00			7,722,085.62
1926	5,871,384.99	985,051.28	2,705,000.00			9,561,436.27
1927	7,476,690.00	1,145,869.34	4,436,500.00	₱2,926,098.38		15,984,658.55
1928	7,876,691.49	1,000,000.00	2,816,000.00	4,500,000.00		16,192,691.49
1929	7,896,181.82	1,200,000.00	3,325,000.00	4,000,000.00		16,421,181.82
1930	8,144,454.01	1,800,000.00	2,812,000.00	4,000,000.00	₱1,317,854.36	18,074,308.37

TABLE II.—AMOUNT EXPENDED FOR ROAD AND BRIDGE CONSTRUCTION AND MAINTENANCE

Year	Maintenance	Construction	Total
1922	₱5,050,554.19	₱2,197,565.64	₱7,248,119.83
1923	5,356,280.19	2,007,147.73	7,363,377.92
1924	5,693,466.40	2,619,316.68	8,312,783.08
1925	5,873,078.68	3,545,890.66	9,418,969.29
1926	5,806,013.33	3,689,750.14	9,495,763.47
1927	6,525,639.46	6,006,544.21	12,532,183.67
1928	6,266,100.58	6,572,885.60	12,828,986.17
1929	6,919,183.84	7,633,825.38	14,553,009.12
1930	7,304,298.34	7,451,277.56	14,755,570.90

TABLE III.—AVERAGE COST OF MAINTAINING FIRST, SECOND AND THIRD-CLASS ROADS

Provinces	First-class roads			Second and third-class roads			Trails
	Length of first-class roads	Total expenditures for maintenance of first-class roads	Average cost per kilometer of maintenance	Length of second and third-class roads	Total expenditures for maintenance of second and third-class roads	Average cost per kilometer of maintenance	Total expenditures
	Kilometers			*Kilometers*			
Abra	81.0	₱35,209.53	₱434.69	62.5	₱7,985.29	₱127.76	₱8,607.76
Agusan				365.0	29,301.71	80.28	2,884.91
Albay	237.3	155,843.54	656.46	123.4	21,827.29	176.88	
Antique	98.7	67,569.71	684.60	102.5	42,982.84	419.34	
Baguio	63.0	75,082.98	1,191.79				
Bataan	46.7	78,480.86	1,680.53	96.2	7,314.54	76.04	
Batanes							26,884.46
Batangas	214.5	139,396.01	655.98	155.1	31,170.45	200.97	
Benguet	72.9	95,939.45	1,096.45				4,793.21
Bohol	266.5	121,051.73	454.23	187.4	46,635.05	248.85	
Bukidnon	10.5	5,396.97	513.92	154.4	58,763.54	380.59	
Bulacan	156.7	161,745.62	1,032.20	186.1	46,907.86	252.06	
Cagayan	107.0	60,558.48	565.97	374.9	45,468.12	121.28	
Camarines Norte	40.9	21,807.61	533.19	80.5	10,221.33	126.97	
Camarines Sur	175.1	150,297.81	858.35	86.8	36,849.68	424.53	
Capiz	205.7	144,893.34	704.39	49.6	22,914.04	461.97	
Cavite	101.3	119,492.14	1,179.60	63.6	10,631.67	167.16	
Cebu	337.3	377,847.54	1,120.21	311.1	135,940.14	436.97	
Cotabato	41.9	38,987.04	930.48	34.8	6,603.51	189.75	18,149.69
Davao	38.1	42,451.85	1,114.22	30.0	21,497.46	716.58	7,040.53
Ilocos Norte	93.4	51,517.26	551.58	134.0	51,092.62	381.29	
Ilocos Sur	197.8	169,102.17	854.91	50.0	29,267.23	585.34	31,969.52
Iloilo	334.1	227,757.98	681.71	72.4	8,493.25	117.31	
Isabela	145.8	111,238.43	762.95	50.3	2,578.42	51.26	
Laguna	179.7	278,156.46	1,547.89	92.7	22,033.83	237.69	
Lanao	51.7	44,973.57	869.89	81.5	14,671.72	180.02	879.46
La Union	141.9	76,201.89	598.60	93.8	19,943.17	212.61	
Leyte	141.8	138,621.85	977.59	254.3	92,259.86	362.80	5,963.69
Marinduque	52.8	27,993.44	530.18	114.1	13,501.20	118.33	2,649.98
Masbate	73.7	28,319.24	384.25				
Mindoro	54.8	40,413.97	737.48	254.0	35,666.84	140.42	
Mountain Province				126.5	56,236.43	444.56	54,206.71
Nueva Ecija	275.5	239,303.27	860.61	116.7	62,988.10	539.74	29,960.98
Nueva Vizcaya	94.1	74,774.75	754.63	152.8	13,151.39	86.07	7,546.26
Occidental Misamis	32.7	32,633.70	997.98	36.7	17,431.52	474.97	
Occidental Negros	427.3	321,468.84	752.33	135.8	71,455.22	526.17	
Oriental Misamis	106.0	59,331.82	559.73	147.2	27,074.37	183.93	
Oriental Negros	213.8	137,453.68	642.91	145.0	32,048.09	221.02	
Palawan				118.0	24,472.31	207.39	
Pampanga	207.2	186,802.05	901.55	67.5	31,725.50	470.01	
Pangasinan	546.5	477,967.13	874.60	25.0	12,539.06	501.56	
Rizal	197.4	224,283.84	1,136.17	23.9	5,944.45	248.72	
Romblon				197.0	36,630.59	185.94	5,548.90
Samar	141.1	97,098.42	688.15	230.0	77,642.44	337.76	
Sorsogon	165.3	111,888.28	676.88	46.1	24,052.63	521.75	
Sulu	56.2	39,498.80	702.83	15.5	6,882.70	444.05	1,738.32
Surigao	75.8	50,250.83	662.94	43.5	3,190.17	73.34	
Tarlac	178.0	148,094.07	831.99	31.6	9,829.89	311.07	
Tayabas	224.7	227,024.66	1,010.35	63.3	10,781.52	170.32	
Zambales	136.9	69,791.57	509.80	28.0	3,717.92	132.78	
Zamboanga	62.1	61,511.11	990.52	76.9	49,626.73	645.34	
Total	6,901.2	5,645,525.29	818.05	5,488.0	1,449,943.69	264.20	208,824.38

DEFINITIONS FOR ROAD CLASSIFICATION

First-class roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing, their places are supplied by ferries capable of carrying automobiles weighing two tons or more, These roads are continuously passable at all times with possible exceptions during typhoon periods.

DAVAO SOUTH ROAD, THROUGH HEMP LANDS, DAVAO PROVINCE

Second-class roads.—Fairly garded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete but, in part, are temporary structures. These roads are continuously passable for vehicle traffic during the dry seasons, but more or less impassable during the rainy season.

Third-class roads.—All traffic routes for carts not included in the the first- and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

Table IV is a complete statement of roads in existence in the various provinces during the year 1929 and 1930 showing increase or decrease in each class of roads as of December 31, 1930.

Table V gives the kind of metalling used on existing roads.

TABLE IV.—COMPARATIVE TABLE OF ROADS IN EXISTENCE IN THE VARIOUS PROVINCES DURING THE YEARS 1928 AND 1929

Provinces	First-class roads			Second-class roads			Third-class roads			Trails		
	1929	1930	Increase (or decrease)	1929	1930	Increase (or decrease)	1929	1930	Increase (or decrease)	1929	1930	(Increase or decrease)
	Kms.	*Kms.*	*Kms*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*
Abra	75.2	86.9	11.7	15.5	15.5	....	21.9	19.7	(2.2)	85.7	78.7	(7.0)
Agusan	....	....	....	41.7	51.5	9.8	17.6	27.0	9.4	22.3	13.4	(8.9)
Albay	231.6	250.4	18.8	47.0	65.5	18.5	28.1	43.0	14.9	108.6	80.4	(28.2)
Antique	98.7	98.7	....	115.9	130.9	15.0	18.4	6.9	(11.5)	3.3	....	(3.3)
Baguio	62.9	65.0	2.1	5.4	5.2	(0.2)	1.7	1.2	(0.5)	....	....	....
Bataan	46.7	46.7	....	18.2	21.5	3.3	2.4	2.4	....	106.3	101.0	(5.3)
Batanes	....	....	....	....	....	....	13.0	13.0	....	86.7	86.7	....
Batangas	208.5	224.7	16.2	73.0	74.8	1.8	148.0	134.1	(8.9)	40.4	65.1	24.7
Benguet	74.2	80.9	8.5	166.5	156.2	(10.3)	14.4	29.1	14.7	223.6	217.4	(6.2)
Bohol	263.4	275.6	12.2	100.2	109.0	8.8	74.2	61.8	12.4)	9.0	11.9	2.9
Bukidnon	....	29.1	29.1	110.6	81.5	(29.1)	80.4	80.4	....	59.9	59.9	....
Bulacan	158.3	159.8	1.5	111.3	117.0	5.7	63.8	59.0	(4.8)	....	....	....
Cagayan	95.7	128.0	32.3	106.9	61.9	(45.0)	74.9	91.6	16.7	109.6	109.8	0.2
Camarines Norte	40.9	40.9	....	22.0	39.3	17.3	33.5	26.3	(7.2)	82.0	72.3	(9.7)
Camarines Sur	175.1	178.6	3.5	65.6	67.6	2.0	45.0	43.8	(1.2)	31.8	32.3	0.5
Capiz	202.3	209.2	6.9	112.7	100.4	(12.3)	50.3	78.3	28.0	88.0	72.9	(15.1)
Cavite	101.3	101.3	....	52.2	67.6	15.4	4.2	4.3	0.1	154.5	168.2	13.7
Cebu	337.3	425.0	87.7	310.3	244.8	(65.5)	92.3	106.4	14.1	20.4	18.6	(1.8)
Cotabato	35.9	52.8	16.9	22.2	18.1	(4.1)	17.4	29.2	11.8	330.7	400.0	69.3
Davao	37.4	40.3	2.9	14.8	17.2	2.4	46.2	51.2	5.0	465.2	455.0	(10.2)
Ilocos Norte	91.4	95.5	4.1	151.7	154.3	2.6	27.1	57.8	30.7	43.9	88.7	44.8
Ilocos Sur	196.3	200.0	3.7	67.8	69.7	1.9	12.2	14.0	1.8	149.7	149.7	....
Iloilo	323.0	346.1	23.1	78.5	63.4	(15.1)	130.4	154.0	23.6	12.6	10.1	(2.5)
Isabela	135.9	156.8	20.9	19.4	1.1	(18.3)	95.2	53.8	(41.4)	....	....	....
Laguna	178.6	188.9	10.3	52.7	49.0	(3.7)	29.9	32.9	3.0	10.3	12.3	2.0
Lanao	50.7	52.6	1.9	24.0	34.4	10.4	50.6	54.7	4.1	287.2	272.1	(15.1)
La Union	141.9	141.8	....	52.8	65.7	12.9	8.3	5.7	(2.6)	13.0	13.0	....

BATAAN-ZAMBALES ROAD (UNDER CONSTRUCTION), ZAMBALES PROVINCE

TABLE IV.—COMPARATIVE TABLE OF ROADS IN EXISTENCE IN THE VARIOUS PROVINCES DURING THE YEARS 1928 AND 1929 —Continued

Provinces	First-class roads			Second-class roads			Third-class roads			Trails		
	1929	1930	(Increase or decrease)	1929	1930	(Increase or decrease)	1929	1930	(Increase or decrease)	1929	1930	(Increase or decrease)
	Kms.	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*	*Kms.*
Leyte	141.8	141.8		146.8	206.7	59.9	47.3	73.3	26.0	73.2	36.6	(36.6)
Marinduque	52.6	53.0	0.4	39.6	56.8	17.2	13.1	3.8	(9.3)	39.4	33.6	(5.8)
Masbate	71.2	85.7	14.5	3.5	12.5	9.0	1.2	1.7	0.5			
Mindoro	54.8	54.8		70.0	90.0	20.0	15.0	13.7	(1.3)	257.2	269.5	12.3
Mountain Province				295.1	330.2	35.1	43.7	37.9	(5.8)	992.2	928.7	(63.5)
Nueva Ecija	270.5	293.3	23.3	37.5	103.7	66.2	225.8	200.5	(25.3)		3.0	3.0
Nueva Vizcaya	94.1	100.6	6.4	18.2	17.0	(1.2)	31.7	27.4	(4.3)	129.2	129.2	
Occidental Misamis	24.8	56.0	31.2	37.3	14.0	(23.3)	12.3	25.4	13.1	65.5	133.3	67.3
Occidental Negros	426.3	430.6	4.3	90.2	88.2	(2.0)	43.4	38.8	(4.6)			
Oriental Misamis	103.6	108.4	4.8	102.0	101.8	(0.2)	69.6	73.0	3.4	38.1	30.0	(8.1)
Oriental Negros	197.4	230.1	32.7	82.2	69.8	(12.4)	37.0	28.6	(8.4)	108.2	110.9	2.7
Palawan				19.4	25.0	5.6	54.8	49.4	(5.4)	74.3	74.3	
Pampanga	204.7	212.0	7.3	84.5	80.0	(4.5)	79.2	77.0	(2.2)			
Pangasinan	542.8	553.4	10.6	48.2	50.4	2.2	125.9	122.2	(3.7)			
Rizal	194.8	201.8	7.0	21.5	22.3	0.8	46.4	39.7	(6.7)	12.3	12.3	
Romblon				99.4	123.3	23.9	1.0		(1.0)	185.1	162.8	(22.3)
Samar	137.0	156.6	19.6	180.4	167.4	(13.0)	73.9	78.0	4.1	2.9	10.6	7.7
Sorsogon	165.3	165.3		42.1	50.5	8.4	9.5	5.3	(4.2)	50.7	51.5	0.8
Sulu	53.7	74.6	20.9	6.3	9.5	3.2	8.7	3.8	(4.9)	152.7	147.4	(5.3)
Surigao	73.3	78.3	5.0	22.7	24.8	2.1	25.2	15.8	(9.4)	0.5		(0.5)
Tarlac	178.0	178.0		24.3	25.0	0.7	14.4	29.6	15.2		26.6	26.6
Tayabas	219.5	230.2	10.7	58.4	65.4	7.0	51.2	100.0	48.8			
Zambales	130.4	145.9	13.5	23.0	16.8	(6.2)				8.4	14.1	5.7
Zamboanga	62.1	62.1		118.2	131.3	13.1	24.0	26.9	2.9	83.5	94.3	10.8
Total	6,760.1	7,286.6	526.5	3,629.7	3,765.5	135.8	2,250.7	2,353.4	102.7	4,818.1	4,857.7	39.6

TABLE V.—TYPE OF SURFACING

Type	December 31, 1929	December 31, 1930	+Increase —Decrease
	Kilometers	*Kilometers*	
Concrete	30.6	30.6	....
Asphalt Penetration	247.6	38.6	+ 38.6
Asphalt Treatment		433.4	+ 185.8
Macadam Stone	1,847.9	1,925.7	+ 77.8
Gravel	4,785.2	5,151.8	+ 366.6
Coral	2,533.1	2,654.4	+ 121.3
Unsurfaced	3,196.1	3,171.0	— 25.1
Total	12,640.5	13,405.5	765.0

KENNON AND NAGUILIAN ROADS

Those insular roads leading from the lowlands to Baguio were maintained at a very reasonable cost. Considerable improvement work was accomplished such as resurfacing and repairing and painting bridges and culverts. On the Kennon Road, the Camp 3 bridge was reconstructed at a cost of ₱12,678.61. The other bridges of the A-Truss Type were reconstructed. On the Naguilian Road, some sections were widened and split roadways constructed on sharp curves.

The following is a comparative statement of traffic over the Kennon and Naguilian Roads for the past three years:

KENNON ROAD

Year	Pedestrians	Bull carts	Animals led	Calesas	Motorcycles	Autos passenger	Autos trucks	Wagons[1]
1928	12,613	4,434	324	....	573	11,198	5,922	....
1929	7,735	1,964	422	....	574	13,028	4,917	66
1930	8,882	515	193	....	407	15,214	5,507	43

NAGUILIAN ROAD

Year	Pedestrians	Bull carts	Animals led	Calesas	Motorcycles	Autos passenger	Autos trucks	Wagons[1]
1928	26,415	1,389	1,851	....	43	14,587	14,260	1,886
1929	15,727	146	654	....	85	19,896	11,602	607
1930	7 886	84	80	....	30	22,825	13,599	....

[1] Military wood wagons.

Auto traffic on the Naguilian Road is heavier than on the Kennon Road largely because of nonpayment of tolls and the increased number of "PU" cars and trucks making regular trips between Baguio and the lowland towns and Bontoc.

The following is a brief description of the more important road construction projects under way during the year:

Agusan–Surigao Interprovincial Road, Agusan Province.—This road project passes through rich agricultural lands suitable for the cultivation of hemp and coconuts. When completed it will have a length of approximately 45.7 kilometers connecting the Provinces of Surigao and Agusan. The work accomplished during the year was the grading of 9.2 kilometers, 5.4 kilometers of which were also surfaced. In addition, several concrete pipe culverts, box culverts and timber bridges were constructed. The total amount expended during the year was ₱29,584.75.

Standard Intermediate School Building, Tarlac, Tarlac

Cagayan Valley Road, Cagayan Province

Bataan–Zambales Interprovincial Road.—This road will connect the municipality of Dinalupihan in the Province of Bataan, and Olongapo, a seaport in the Province of Zambales. It will provide a direct overland route to Manila from the Province of Zambales and western Pangasinan. The Zambales section of this road is 22.2 kilometers long and the Bataan section is 19.5 kilometers. The Work accomplished during the year included the grading of about 3 kilometers and the surfacing of 6.5 kilometers on the Bataan side, and the surfacing of about 7 kilometers on the Zambales side. Several culverts were also placed. The total expenditure during the year in the Province of Bataan was ₱52,877.94 and in the Province of Zambales ₱61,776.91.

Batangas–Cavite Interprovincial Road.—The road will connect Tuy, Batangas Province, with Indang, via Mendez, Cavite Province, and will establish a direct route from Manila to western Batangas, following the Tagaytay Ridge. The proposed road is 19.1 kilometers on the Batangas side and 22.2 kilometers on the Cavite side. During the previous years the grading work was within 2 kilometers from the boundary with 6½ kilometers surfaced on the Batangas side. During the year one concrete box culvert was constructed in addition to the completion of about one kilometer of surfacing. On the Cavite side, 2.8 kilometers of subgrade was added during the year to the 8.1 kilometers that were previously completed making a total of 10.9 kilometers of graded section from Indang toward the boundary, 3 kilometers of which was also surfaced during the year. Several culverts were also installed. The amount of ₱20,151.93 were expended on the Batangas side and ₱25,102.22 on the Cavite side.

Cagayan Valley Road, Cagayan Province.—This project is approximately 117.0 kilometers long. The construction work was confined to the unfinished section from Alcala to Aparri, a distance of 65.5 kilometers. During the year, 14.5 kilometers were completed as first-class macadam road. Enough crushed rock to surface one kilometer was already delivered along the road ready to be spread. In addition, several Armco pipe and reinforced concrete pipe culverts were installed and a number of timber bridges were constructed during the year. The total amount expended was ₱82,230.31.

Cagayan Valley Road, Isabela Province.—This road is approximately 148.9 kilometers long, of which 117.9 kilometers were finished as first-class road in previous years. On the Ilagan–Cauayan section which is 34.8 kilometers long, 10.3 kilometers were completed as first-class road during the year, thus leaving the whole section finished. Only four more box culverts, the construction of which

ZAMBOANGA–BUENAVISTA ROAD, ZAMBOANGA PROVINCE

have already been advertised, remain to be constructed in 1931. On the Ilagan–Cabagan section, which is 41.0 kilometers long, 7.6 kilometers were finished during the year, thus leaving the whole section a first-class road. The amount expended for both sections during the year was ₱59,698.51.

Cagayan Valley Road, Nueva Vizcaya Province.—This road is 103.8 kilometers long, 7.5 kilometers of which were unfinished at the beginning of the year. This section is near the Nueva Ecija boundary between Balete Pass and Santa Fe. The work during the year consisted in widening and grading the old road and surfacing of some sections. There remain about 2.6 kilometers more to be widened. Considerable work was also done in removing the slides and maintaining the road during the typhoon season in order to make it passable all the times. The amount expended during the year was ₱74,468.09.

Capiz–Antique Interprovincial Road, Capiz Province.—The length of the road within the Province of Capiz is 60.9 kilometers covering the distance from Ivisan to Banga. The sections from Ivisan to Sapian (11.5 kms.) and from Balete to Banga (11.3 kms.) have previously been completed as second-class road. During the year the subgrade of 10.5 kilometers was widened, the first course surfacing was placed on 7 kilometers of road; the surfacing materials for 2 kilometers were placed on the side of the road ready for spreading, and a considerable number of the necessary concrete culverts and temporary structures were completed. Only 2 kilometers remain without the necessary concrete pipe culverts, but the temporary bridges on these are already completed. The amount expended during the year was ₱44,683.3.

Capiz–Iloilo Interprovincial Road, Capiz Province.—This road is 19.6 kilometers long. In previous years, a 3-meter subgrade for 17.6 kilometers had been completed. During the year, the subgrade for 9 kilometers of this section was widened to 6 meters. A 3-meter subgrade was also completed on the last two kilometers. First course surfacing was spread on 4.8 kilometers. Several concrete pipes were manufactured ready for placing to complete the required concrete pipe culverts, and one 48-foot timber bridge, was also constructed. The amount expended during the year was ₱44,683.30.

Cotabato–Davao Interprovincial Road.—Of all the important road projects under construction in the Islands, this one will undoubtedly open up the largest area of rich agricultural lands. On the Cotabato side, this road is 116.9 kilometers from Simuay to Kidapawan. The work accomplished during the year consists in the grading of 11 kilometers, completion of 2 kilometers of first-class road and the delivery of first course rock for 2 kilometers. On the Davao side, this road is 114.5 kilometers which is the distance from Davao to Kidapawan. During the year, a considerable amount of grading and surfacing work was done. Several culverts were also constructed. The amount expended during the year on the Cotabato side was ₱39,880.69 and on the Davao side, ₱60,875.98.

PILILLA-QUISAO ROAD, RIZAL PROVINCE

Cotabato–Lanao Interprovincial Road.—The Cotabato section of this road is 59.3 kilometers long and the Lanao section 105 kilometers. In Cotabato Province, ₱51,511.82 was expended during the year for the construction of 3 kilometers of subgrade, 10.9 kilometers of completed first course surfacing work, 0.6 kilometer of completed second course, 5 timber bridges with nipa roofing, having a total length of 45 meters, and several lines of concrete pipe culverts. Eight kilometers of the Cotabato section are already in first-class condition.

In Lanao Province, ₱29,587.05 was expended during the year for the construction of 9 kilometers of subgrade, 6 timber bridges aggregating 36 meters in span and 9 lines of reinforced concrete pipe culverts. Before the end of the year the section from Ganassi to Lake Lapao was opened to automobile traffic.

Camarines Norte–Camarines Sur Interprovincial Road.—This road is 26.0 kilometers in Camarines Norte and 51.8 kilometers in Camarines Sur. The work accomplished on the Camarines Norte side during the year comprised the subgrading of 8 kilometers, construction of 12 wooden bridges having an aggregate length of 250 meters, construction and installation of several concrete and G. I. pipe culverts, placing of second course stone on two kilometers and first course on 4 kilometers and the delivery of first course stone for 3 kilometers. At the end of the year, there were 2 kilometers of first-class road, 12 kilometers of second class and 12 kilometers of subgrade. The amount expended during the year was ₱65,433.99.

The work accomplished on the Camarines Sur side comprised the grading of 5.5 kilometers and the surfacing of 3.0 kilometers, making a total at the end of the year of 25 kilometers of second-class road, 5.5 kilometers of subgrade and 9 kilometers yet to be graded between Calagbangan and Bai. The amount expended during the year was ₱44,032.

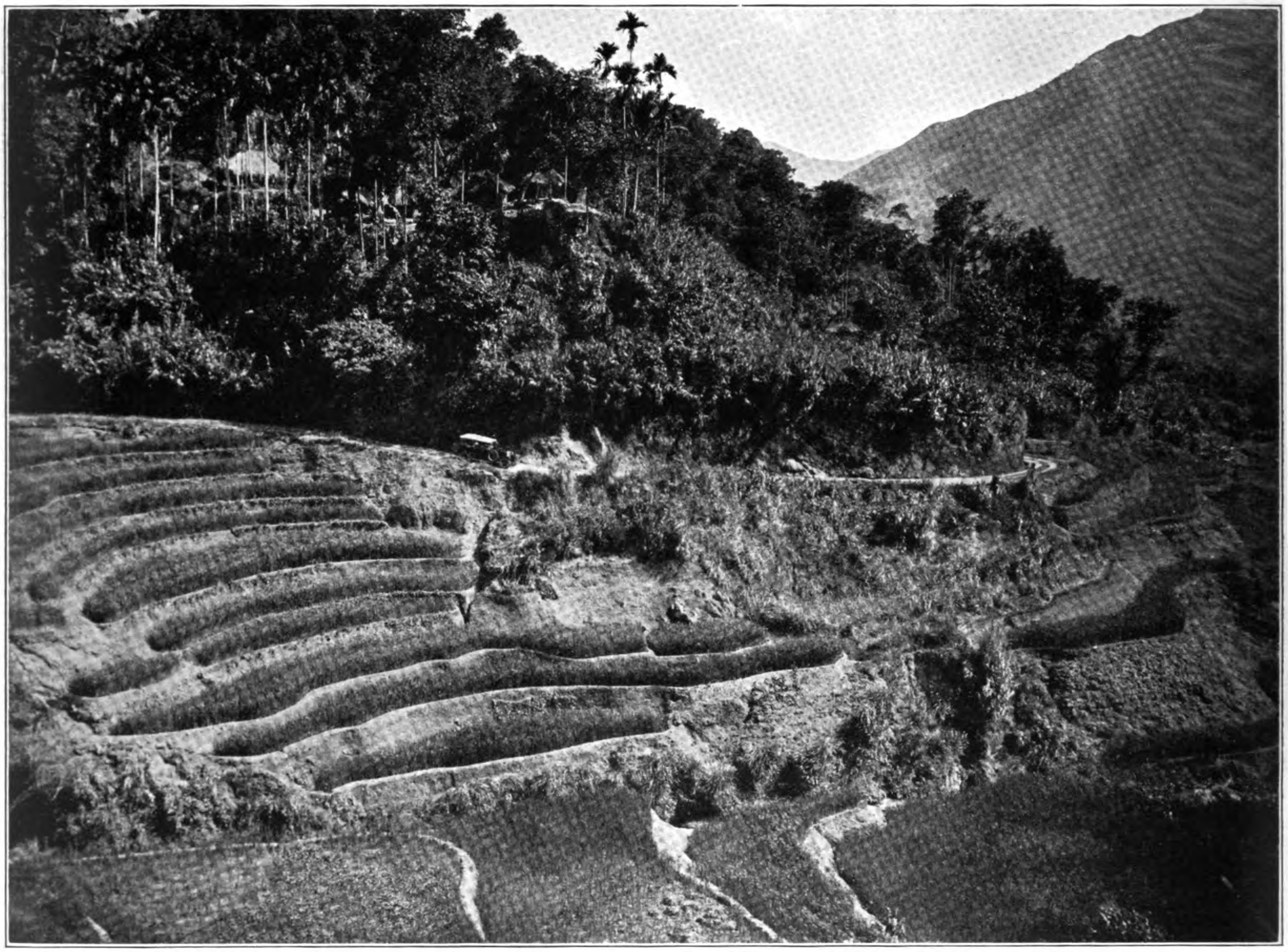
Camarines Norte–Tayabas Interprovincial Road.—The total length of this road from Gumaca, Tayabas to Labo, Camarines Norte is 135.1 kilometers of which 60.9 is in the Province of Tayabas and 74.2 in the Province of Camarines Norte. The sum of ₱30,147.66 was expended in the Province of Camarines Norte for the construction of 4.1 kilometers of 5-meter subgrade, widening of subgrade of 3 kilometers from 3 meters to 5 meters and the placing of first and second course surfacing of 3 kilometers. At the end of the year there were 7 kilometers of first-class road, 3 kilometers of second class and 11.5 kilometers of subgrade.

In the Province of Tayabas ₱30,033.26 was expended for the grading of 3.8 kilometers surfacing of 0.4 kilometer with first course, construction of one timber bridge and repairing of 6 kilometers of finished subgrade. At the end of the year, there were 2.5 kilometers of first-class road, and 15 kilometers of subgrade.

Baybay–Abuyog Road, Province of Leyte.—This is a coast to coast road 52 kilometers long. During the year the amount of ₱62,366.18 was expended for the construction of 5½ kilometers of second-class road, and 5½ kilometers of subgrade. At the end of the year there were 17½ kilometers of second-class road.

Ilocos Norte–Cagayan Interprovincial Road.—The Ilocos Norte side of this road is 39.2 kilometers long. During the year, ₱40,888.44 was expended for the grading work on the Banua–Pasaleng section through the Patapot slides and the removal of slides and improvement of the Bangui–Banua section which is already a second-class road.

The Cagayan side is 109.1 kilometers long. During the year, ₱73,320.61 was expended for the grading of 5.5 kilometers on the Camalaniugan–Pamplona section (49.1 Kms.); grading of whole section (6 Kms.) of the Pamplona–Bidduan section and the construction of one timber bridge; grading of 6 kilometers of the Bidduan–



BANAUE–BAGABAG ROAD, MOUNTAIN PROVINCE

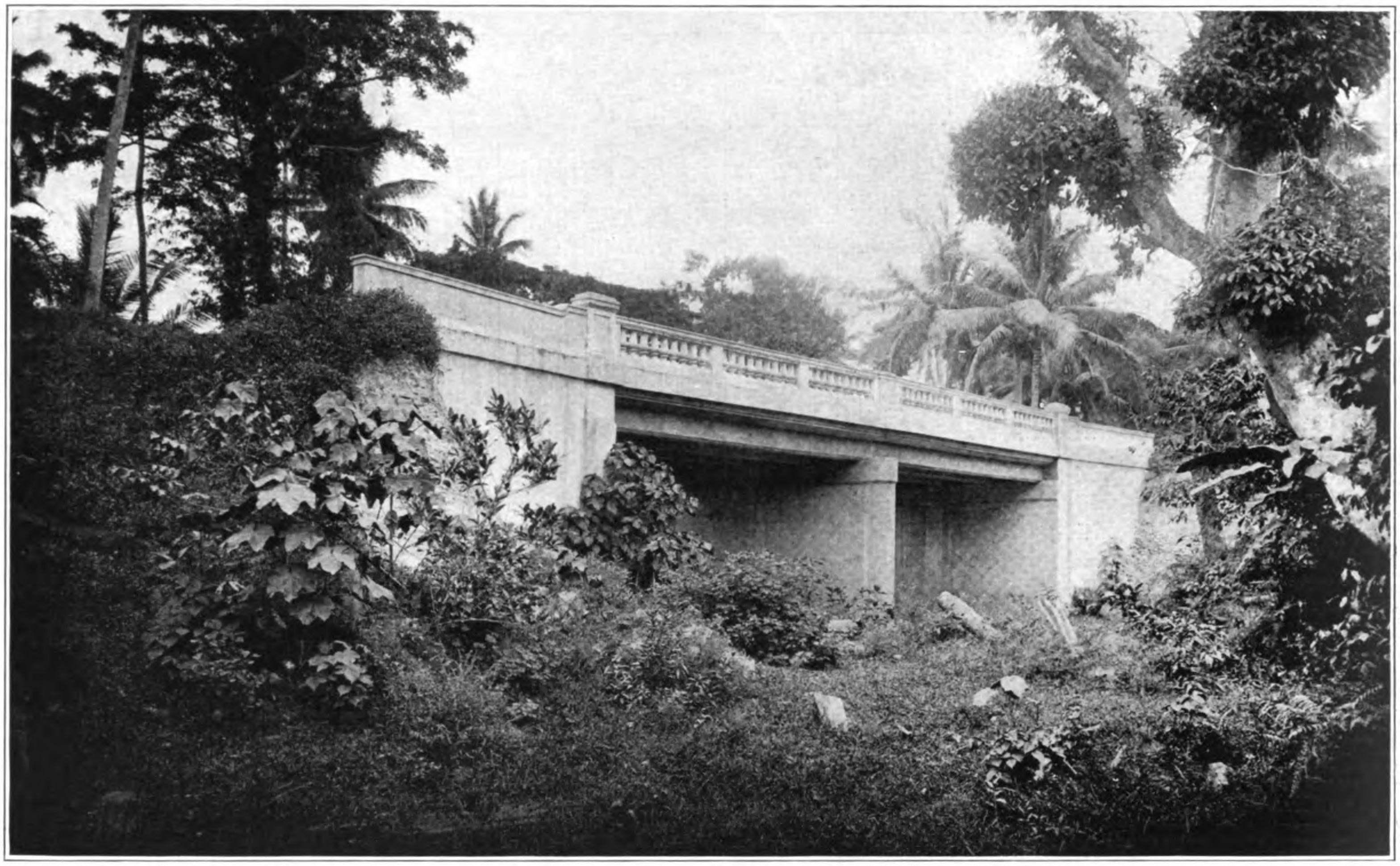
Claveria section (30.7 Kms.), spreading of first course surfacing on 4 kilometers and construction of four timber bridges; grading of 8 kilometers of the Claveria–Ilocos Norte boundary section (23.3 Kms.) and the construction of timber bridges. During the dry season the Pamplona–Bidduan section and 17.3 kilometers of the Claveria–Langangan section are passable by motor vehicles.

Samar–Leyte Interprovincial Road.—This road connects Catbalogan, Province of Samar and Tacloban, Province of Leyte. The section from Wright to the proposed San Juanito Strait Crossing at La Paz has been surveyed. The survey is being continued to the Amandayehan port where ferry boats can easily be operated across the channel to Tacloban. During the year, ₱48,985.83 was expended for the grading of 10.9 kilometers from Wright to Kinabangan and the installation of the necessary concrete pipe culverts and timber bridges for the first 5 kilometers.

Pampanga Concrete Road, Pampanga Province.—The work on this project consisted in widening the old 4 meter macadam road to 6 meters, and in laying on this a layer of concrete 0.125 meter thick at the center and 0.18 meter at the edges. At the end of the year there were 25.8 kilometers of finished concrete pavement, 1.8 kilometers of which was done by contract and the rest by administration. During the year, ₱70,278.28 was expended on this project, making a total expenditure at the end of the year of ₱843,555.54.

TABLE VI.—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1930

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure to December 31, 1930	Expenditure in 1930	Work accomplished		Remarks
								To date	During 1929	
		Kms.						*P. ct.*	*P. ct.*	
Abra	Peñarubia–Pilar Road			₱103,913.88	₱8,392.00	₱98,070.46	₱19,565.18			Grading.
Do	Bangued–Lagayan Road	20.4		67,625.00	16,675.00	63,887.84	18,147.32			Improvement of present road.
Do	Lagañgilang-Dolores-San Juan Road.			18,935.00	2,000.00	15,252.65	12,245.91			Grading and surfacing.
Do	Bucay–Sallapadan Road			10,000.00	5,000.00	6,438.27	5,780.50			Grading.
Agusan	Agusan-Surigao Interprovincial Road.	45.7	₱2,493,000.00	112,438.68	30,000.00	111,799.08	29,584.75	4	1	Grading and surfacing.
Do	Butuan–Nasipit Road			167,596.0	62,120.00	157,363.60	65,975.00			Do.



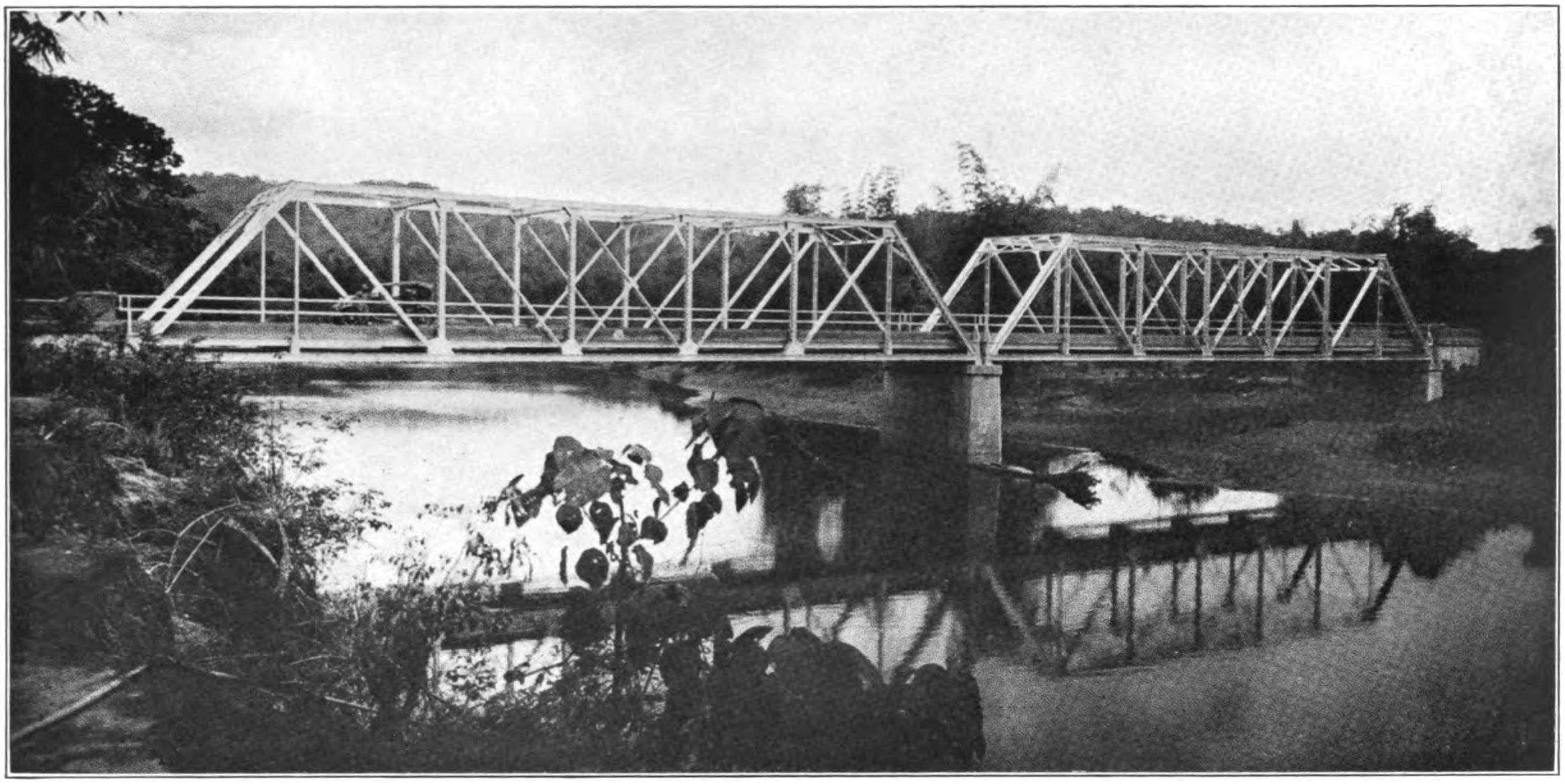
LINAUAN BRIDGE, CAMARINES NORTE PROVINCE

TABLE VI—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1930—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure to December 31, 1930	Expenditure in 1930	Work accomplished		Remarks
								To date	During 1929	
		Kms.						*P.ct.*	*P.ct.*	
Albay	Naga–Joroan Road	7.4	₱96,185.00	₱74,731.67	₱5,600.00	₱74,728,15	₱5,596.48	78	6	Grading and surfacing
Do	Masarawag–Muladacad Road			30,957.25	300.00	30,666.99	3,868.06			Do.
Do	Ligao–Panganiran Road			147,785.25	40,389.74	147,785.25	48,443.65			Grading and structures.
Do	Legaspi–Manito Road			96,259.28	9,700.00	91,660.97	8,072.27			Do.
Do	Oas–Libon Road	7.3	139,781.00	20,123.34	10,125.34	20,119.34	11,520.55	14	8	Do.
Do	Guinobatan–Balolo Road			18,460.33	9,460.33	18,460.33	13,919.10			Grading, surfacing and structures.
Do	Matacom–Magpanambu Road	5.5	72,633.00	11,629.00	11,629.00	8,015.97	8,015.97	11	11	Grading and structures.
Do	Taysan–Maslog Road	3.9	28,467.00	9,783.61	4,281.44	9,783.61	4,281.44	34	15	Do.
Do	Pandan–Carmoran Road	8.6	178,810.00	60,441.02	10,325.57	60,441.02	15,720.95	34	9	Grading, surfacing and structures.
Do	Viga–Bagamanoc Road	9.8	81,917.00	56,703.09	10,000.00	56,360.69	24,501.04	68	30	Do.
Do	Vato–Baras Road	13.7	166,364.00	65,929.90	10,000.00	63,072.35	19,041.67	38	11	Do.
Do	Cololbon–Codon Road			17,804.40	5,172.00	15,794.68	6,848.36			Do.
Do	Bato–Viga Road			9,500.00	9,500.00	6,948.45	6,948.45			Do.
Antique	Asluman–South Road	39.7		81,340.26	8,000.00	80,969.48	7,742.82			Do.
Do	Igbalangao–Valderrama Road	10.0	87,135.00	62,603.86	15,050.00	58,632.00	15,371.85	67	18	Do.
Bataan	Limay–Lamao Road	6.5	183,650.00	17,841.00	16,556.78	13,936.84	12,652.62	8	7	Do.
Do	Bataan–Zambales Road	19.5	313,235.00	258,681.55	57,518.13	254,046.86	52,877.94	81	17	Do.
Batangas	Taal–Alitagtag Road			8,000.00	8,000.00	2,384.16	2,384.16			Grading.
Do	Bolbok–Laiya Road	20.1	427,400.00	15,000.00	15,000.00	13,176.86	13,176.86	3	3	Do.
Do	Batangas Boulevard	1.1	49,548.00	5,000.00	5,000.00	4,830.72	4,830.72	10	10	Grading and surfacing
Do	San Jose–Lipa Road	12.6	163,512.00	44,800.00	15,000.00	4,797.31	15,001.79	27	9	Surfacing.
Do	Taal–San Nicolas Road	7.3		50,000.00	10,000.00	49,818.98	21,399.84			Grading.
Do	Alitagtag–San Luis Road	8.9	152,619.00	15,000.00	5,000.00	14,960.35	4,962.35	10	3	Surfacing.
Do	Tuy–Calatagan Road	28.2	620,291.00	70,719.14	20,000.00	65,164.50	16,654.52	11	3	Grading and surfacing.
Do	Rosario–Taysan	7.4	174,572.00	40,000.00	12,000.00	36,189.90	13,451.30	21	8	Surfacing.
Do	Batangas–Laguna Interprovincial Road.	7.4	122,931.00	71,118.08	30,000.00	71,111.85	30,073.24	58	24	Widening and surfacing.
Do	Batangas–Cavite Interprovincial Road.	19.1	423,398.00	125,498.70	30,000.00	114,309.84	20,151.93	27	5	Grading and surfacing.
Do	Cuenca–Banaybanay Road	8.6	220,740.00	95,254.07	18,876.00	95,177.29	29,930.79	43	14	Surfacing.
Do	Bauan–Mabini Road	8.3	173,783.00	70,562.57	20,904.00	70,551.48	27,386.09	40	16	Grading and surfacing.
Do	Lipa–Balete Road			88,209.87	10,000.00	88,209.38	10,972.91			Surfacing.
Bohol	Jagna–Sierra Bullones Road			68,119.95	30,750.00	68,141.14	34,014.49			Grading and structures. .
Do	Batuanan–Ubay Road	20.5	225,850.00	91,366.03	10,300.00	91,332.84	13,515.44	41	6	Surfacing.
Do	Balilihan–Tubigon Road			19,000.00	19,000.00	11,180.32	11,180.32			Grading.
Do	Loay–Interior Road	79.4	624,000.00	491,165.18	16,751.00	483,683.58	26,450.79	77	4	Surfacing.
Do	Jetafe–Talibon Road			10,000.00	10,000.00	9,674.11	9,674.11			Grading and structures.
Do	Ipil–Talibon Road	10.9	121,944.00	19,000.00	19,000.00	10,384.34	10,384.34	9	9	Grading.
Do	Inabanga–Jetafe Road	20.8	207,118.00	115,099.32	18,084.00	108,878.02	11,812.70	53	6	Do.
Do	Candijay–Baluanan Road			15,000.00	15,000.00	14,984.67	14,984.67			Surfacing.
Bukidnon	Bukidnon–Misamis Boundary Road.			109,011.00	50,765.00	102,227.11	44,733.35			Do.
Do	Malaybalay–Maramag Road			6,000.00	6,000.00	5,930.41	5,930.41			Grading.

TABLE VI—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1930—Continued

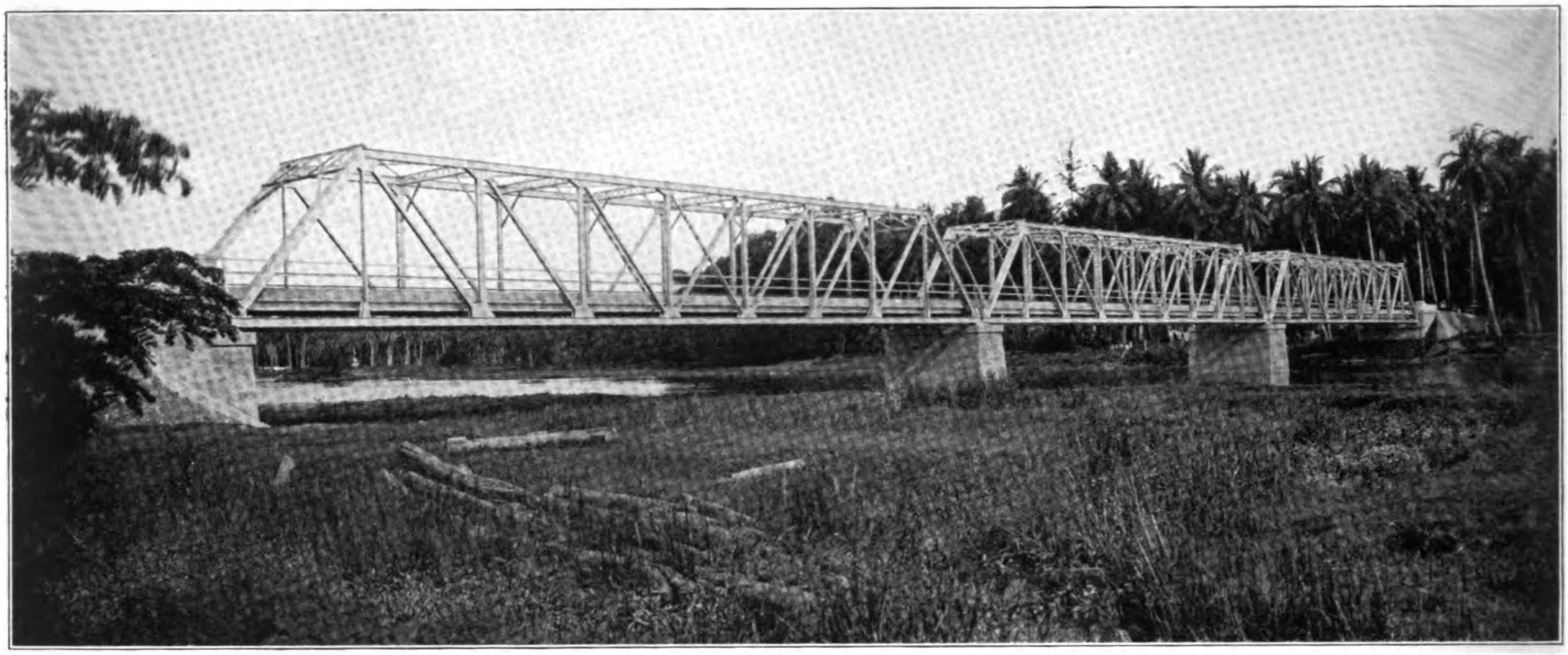
Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure to December 31, 1930	Expenditure in 1930	Work accomplished		Remarks
								To date	During 1929	
		Kms.						*P.ct.*	*P.ct.*	
Bulacan	Pulilan–Calumpit Road	4.3	₱74,909.00	₱35,000.00	₱35,000.00	₱22,058.86	₱22,058.86	29	29	Grading and surfacing.
Do	Santa Maria–Norzagaray Road	12.8	138,680.00	30,000.00	10,000.00	29,293.62	21,672.03	21	16	Do.
Do	Dampalit–Pinagkabalian Road	1.3		16,167.23	4,167.71	16,107.22	16,060.41			Do.
Do	Sibul–Biaknabato Road	8.2		21.000.00	6,000.00	20,919.44	5,969.72			Do.
Do	Bigaa–Pandi–Angat Road			8,537.71	8,537.71	8,537.71	8,537.71			Do.
Cagayan	Cagayan Valley Road	117.0	1,421,014.00	1,084,445.23	91,464.00	1,069,770.50	82,230.31	75	6	Surfacing and structures.
Do	Cagayan–Ilocos Norte Interprovincial Road	109.1	1,529,157.00	222,384.35	40,000.00	222,282.06	73,320.61	15	5	Grading, surfacing and structures.
Do	Cagayan–Mt. Province Interprovincial Road.			98,262.33	40,000.00	98,254.13	42,044.70			Grading and surfacing.
Do	Tuguegarao–Peñablanca Road	8.0	92,874.00	48,163.50	5,000.00	48,141.17	9,244.31	52	10	Surfacing.
Do	Baybayog–Baggao Road	11.8		78,190.28	17,750.00	78,139.79	41,175.47			Grading and surfacing.
Do	Dungao–Faire Road	12.0	199,180.00	19,912.00	19,912.00	10,341.12	10,341.12	5	5	Grading.
Do	Solana–Enrile Road	7.8		5,000.00	5,000.00	4,999.95	4,999.95			Do.
Do	Abulog–Ballesteros Road	8.0		14,218.00	9,000.00	11,911.51	6,693.51			Surfacing.
Camarines Norte	Camarines Norte–Camarine Sur Interprovincial Road.	16.0	498,128.00	208,909.83	75,875.17	196,307.21	65,433.99	39	13	Grading, surfacing and structures.
Do	Camarines Norte–Tayabas Interprovincial Road.	75.2		136,779.60	30,000.00	136,142.70	30,147.66			Grading and surfacing.
Do	Labo–Mambulao Road	24.5		211,593.00	20,592.00	201,851.73	14,805.75			Grading, surfacing and, structures.
Do	Daet–Bagasbas Road			9,963.00	2,963.00	8,105.47	5,067.21			Grading and surfacing.
Do	Daet–Mampurag Road			9,000.00	9,000.00	8,197.11	8,197.11			Do.
Do	Capalonga–Alayao Road			5,000.00	5,000.00	4,979.41	4,979.41			Grading.
Camarines Sur	Camarines Sur–Camarines Norte Interprovincial Road	62.0	1,760,000.00	182,554.73	65,000.00	148,686.47	44,032.00	8	2	Grading and surfacing.
Do	Sagnay–Tiwi			73,000.00	43,000.00	42,238.22	40,354.50			Do.
Capiz	Capiz–Antique Interprovincial Road.	60.9		220,555.32	50,095.00	214,973.23	44,683.30			Do.
Do	Capiz–Iloilo Interprovincial Road.	24.6	330,113.00	110,745.50	30,000.00	110,528.58	43,367.77	33	13	Do.
Do	Banga–Libacao Road	18.9	325,843.00	71,136.08	15,000.00	66,083.62	9,961.76	20	3	Do.
Do	Cuartero–Dumalag Road	5.5	60,404.00	52,156.00	8,602.00	49,922.73	10,152.46	82	17	Do.
Do	Panay–Pontevedra	10.5		35,000.00		34,999.98	10,626.27			Do.
Do	Mambusao–Jamindan Road	15.7	269,528.00	29,052.00	19,052.00	25,620.22	16,458.56	9	6	Do.
Do	Panitan–Calaan	4.4	29,028.00	10,000.00		6,150.23	6,150.23	21	21	Do.
Do	Altavas–Batan Road	9.2	237,122.00	24,234.72	16,234.72	15,283.74	15,283.74	6	6	Do.
Do	Panay–Panitan Road	7.2	79,214.00	10,000.00	10,000.00	7,371.97	7,371.97	9	9	Grading.
Cavite	Amaya–Naic			30,822.00	20,622.00	13,161.38	12,709.55			Do.
Do	Cavite–Batangas Interprovincial Road.	22.2		133,260.03	30,000.00	119,215.18	25,102.22			Grading and surfacing.
Do	Buenavista–Halang Road	12.9	180,985.00	33,027.53	2,752.29	25,629.10	3,068.24	14	2	Do.
Do	Tanza–Quintana Road			29,357.80	7,339.45	31,165.52	12,827.29			Do.
Do	Naic–Sahing Road	4.9	52,697.00	23,853.21	4,587.16	17,178.41	8,312.94	32	16	Do.
Do	Anabu–Salitran Road			2,752.29	2,752.29	2,751.99	2,751.99			Do.
Do	San Nicolas–Paliparan Road				9,174.31	8,455.92	8,455.92			Surfacing.
Cebu	Logo–Taboilan Road	21.0	315,000.00	290,127.77	30,000.00	280,152.65	24,855.15	89	8	Grading and surfacing.
Do	Sagay–Borbon Road			11,000.00		10,488.87	7,442.57			Grading, surfacing and structures.
Do	Badia–Santander Road			25,000.00		25,000.00	3,855.48			Grading.
Do	San Francisco–Consuelo Road			25,000.00	20,000.00	19,270.29	14,358.47			Grading and surfacing.
Do	Poro–Esperanza			13,500.00	8,000.00	7,174.45	1,786.20			Grading.
Do	Tudelo–Villahermosa Road			13,500.00	8,000.00	8,011.13	3,045.65			Grading and surfacing.
Do	Pilar–Lanao			10,000.00		3,681.28	3,345.60			Grading.
Do	Bogo–Guadalupe Road			10,000.00	10,000.00	8,759.64	8,759.64			Do.
Do	Dumanjug–Sibonga Road			9,000.00	9,000.00	6,356.27	6,356.27			Do.
Do	S. Remigio–Tambongan Road	8.4		8,000.00	8,000.00	7,933.15	7,933.15			Do.
Do	Badian–Alegria Road			13,477.00	13,477.00	13,278.11	13,278.11			Surfacing.
Do	Bantayan–Santa Fe Road			10,000.00	10,000.00	10,000.00	10,000.00			Do.
Do	Alcoy–Boljoon Road			24,000.00	24,000.00	20,772.81	20,772.81			Do.
Cotabato	Lumupog–Bual Road	16.2	165,681.00	140,000.00	4,105.85	136,668.52	19,517.39	82	12	Grading and surfacing.
Do	Cotabato–Lanao Interprovincial Road.	58.1	993,836.00	219,979.55	71,194.00	193,957.11	51,511.82	21	5	Do.
Do	Cotabato–Davao Interprovincial Road.	116.9	1,155,494.00	103,942.26	40,000.00	103,322.73	39,880.69	9	3	Do.
Do	Tamontaca–Upi Road	19.3	260,330.00	14,000.00	14,000.00	11,505.24	11,505.24	4	4	Grading.
Do	Dulawan–Maganoy Road	15.4		10,002.87	3,604.85	227.05	227.05			Do.
Davao	Cuabo–Mati–Boston Road			263,590.00	8,100.00	260,937.59	5,900.04			Grading and surfacing.
Do	Davao–North Road			166,928.66	21,153.00	163,672.74	12,076.32			Do.
Do	Davao–Cotabato Interprovincial Road.	114.5	1,519,709.00	432,966.76	77,600.00	416,242.74	60,875.98	27	4	Do.
Do	Talomo–Mintal Road	7.0	85,400.00	52,730.51	5,000.00	36,281.42	24,175.50	42	28	Do.
Ilocos Norte	Ilocos Norte–Cagayan Interprovincial Road.	107.0		524,687.74	42,500.00	521,361.96	40,888.44			Grading.
Do	Pinili–Nueva Era Road	30.0		95,929.40	4,000.00	93,226.16	5,106.68			Do.
Do	Vintar–Piddig Road			8,669.06	2,500.00	7,664.69	4,431.15			Do.
Do	Solsona–Kabugao Road			51,030.59	5,700.00	46,047.05	15,599.76			Do.
Do	Badoc Diversion Road	4.5		39,440.00	14,440.00	19,567.62	6,533.61			Do.
Do	Laoag–Paoay Road			6,000.00	6,000.00	2,312.92	2,312.92			Do.
Ilocos Sur	Tagudin–Cervantes Road	69.1		40,423.37	15,000.00	40,290.74	26,969.57			Improvement of present road.
Do	Candon–Bauguen Road	12.4	108,553.00	98,231.76	18,231.76	98,164.96	18,033.20	91	17	Surfacing.
Do	Quimarayan Diversion Road	1.8	17,342.00	15,000.00	15,000.00	9,998.28	9,998.28	58	58	Grading and structures.
Do	Santiago–Banayoyo Road	3.3		6,000.00	6,000.00	5,916.43	5,916.43			Do.
Do	San Vicente–San Ildefonso Road			5,000.00	5,000.00	5,000.00	5,000.00			Do.
Iloilo	Guimbal–Tabugon Road	12.5		60,083.66	20,000.00	54,870.90	16,850.31			Surfacing.
Do	Tigbauan–Cordova Road			30,800.64	15,140.00	25,651.11	10,064.65			Do.
Do	Janiuay–Lambunao Road	15.0		133,846.13	5,000.00	133,770.69	16,065.11	100	3	Do.
Do	Barotac Nuevo–North Road	58.0	561,663.00	272,233.63	35,000.00	267,154.07	30,269.29	47	5	Grading and surfacing.
Do	Alimodian–Maasim Road	8.8	199,718.00	33,632.34	4,000.00	29,608.26	10,696.79	15	5	Grading.
Do	San Dionisio–Balasan Road	25.5	257,272.00	132,275.82	40,000.00	132,236.90	43,680.64	51	17	Surfacing.
Do	Balasan–Carlos Road	12.7		29,500.00	10,000.00	29,197.82	15,918.55			Grading and surfacing.
Do	Lambunao–Calinog Road	9.6	193,735.00	39,460.00		38,100.09	5,312.59	20	3	Do.
Do	Asphalt Pavement		110,200.00	81,570.00	45,000.00	81,134.73	53,918.05	74	49	Do.
Do	Tiolas–Sinugbuhan Road	14.6	169,365.00	50,000.00	24,000.00	49,228.47	19,516.84	29	12	Do.
Do	Cabatuan–San Miguel Road	10.4	101,785.00	19,000.00	9,000.00	17,283.96	7,298.17	17	7	Grading.
Do	Pavia–San Miguel Road	3.8	39,379.00	10,570.00		9,819.94	4,304.72	25	11	Grading and surfacing.
Isabela	Echague–Jones Road	19.6	200,152.00	68,258.78	32,574.00	46,990.52	25,803.61	24	13	Do.
Do	Cagayan Valley Road	148.9	1,100,000.00	853,130.36	69,438.23	838,910.44	59,698.51	77	5	Surfacing.
Do	Cauayan–Cabatuan Road	12.0	91,614.00	41,284.41	9,174.31	1,693.61	1,693.61	2	2	Grading.
Laguna	San Pablo–Batangas Boundary Road.	12.1	212,025.00	165,225.75	52,500.00	155,289.28	47,563.58	78	23	Surfacing.
Do	Mabitac–Pililla Road	12.0	271,503.00	135,664.98	30,000.00	135,460.38	31,557.52	50	12	Grading and surfacing.
Do	Biñan–Diversion Road	1.7	37,179.00	35,000.00	19,000.00	29,806.49	13,892.73	81	32	Do.
Do	Luisiana–Botocan–Dalitiwan Road.	6.7	120,421.00	121,083.00	660.00	120,956.17	7,344.65	100	6	Surfacing financed by Manila Electric Co.
Do	Alaminos–Lipa Road	3.4	61,536.00	10,000.00		9,989.03	897.68	16	2	Surfacing.
Do	Sambat–Calumpang Road	7.2	60,640.00	14,000.00	14,000.00	9,976.30	9,976.30	16	16	Grading, temporary bridges and concrete pipe culverts.



CABANGAN RIVER BRIDGE, ZAMBALES PROVINCE

TABLE VI—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1930— Continued

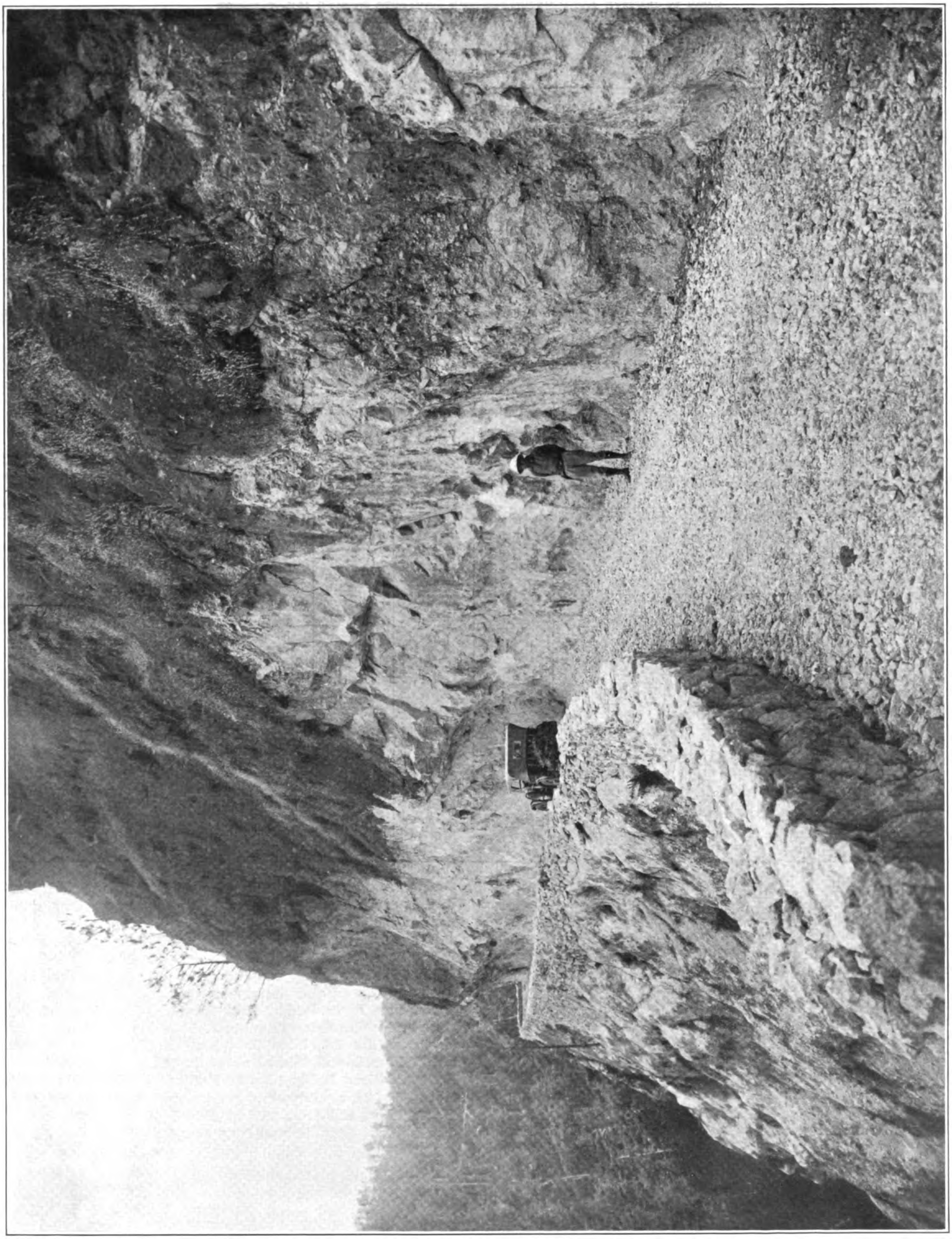
Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure to December 31, 1930	Expenditure in 1930	Work accomplished		Remarks
								To date	During 1929	
		Kms.						*P.ct.*	*P.ct.*	
Laguna	San Pablo–Dolores Road	4.5	₱69,359.00	₱10,000.00	₱10,000.00	₱9,973.89	₱9,973.89	14	14	Grading and pipe culverts.
Do	Mabitac–Santa Maria Road	2.4		33,032.80	5,000.00	32,594.08	5,008.03			Surfacing.
Lanao	Iligan–Misamis Boundary Road	9.7	178,875.00	75,207.67	30,000.00	52,876.44	15,390.40	30	8	Temporary structures and concrete pipe culverts.
Do	Lanao–Cotabato Interprovincial Road.			130,110.12	30,000.00	129,624.55	29,587.05			Grading, temporary bridges and concrete pipe culverts.
Do	Overton–Kolambugan Road			38,486.00	15,634.00	38,239.02	22,724.96			Grading, surfacing temporary bridges and concrete culverts.
Do	Dansalan–Ramain Road	13.0		24,000.00	4,000.00	23,100.83	9,949.71			Grading, temporary bridges and concrete pipe culverts.
La Union	Bacnotan–San Gabriel Road	7.8	139,153.66	15,924.91	5,800.00	12,622.48	1,500.75	9	1	Surfacing.
Do	Tubao–Pugo Road	8.2	290,052.00	22,648.96	21,242.00	16,047.35	8,649.52	6	3	Grading and concrete pipe culverts.
Do	La Union–Pangasinan Interprovincial Road.	4.3	44,836.87	45,000.00		44,836.87	5,484.06	100	8	Payment of right-of-way.
Do	Agoo–Beach Road	3.2	38,361.00	6,000.00	3,500.00	9,971.44	5,821.64	26	16	Grading and concrete pipe culverts.
Do	Aringay–Beach Road	2.6	77,290.08	3,750.00	1,250.00	3,600.63	2,294.99	4	3	Grading and surfacing.
Do	Bauang–Beach Road	1.8	19,447.00	4,250.00	500.00	3,597.35	2,793.26	19	14	Grading.
Leyte	Baybay–Abuyog Road	51.0	505,490.00	366,395.44	65,000.00	356,548.16	62,366.10	70	12	Grading and surfacing.
Do	Ormoc–Capoocan Road			149,917.76	16,000.00	137,153.13	14,355.30			Grading and temporary structures.
Do	Palompon–Valencia Road	9.9	165,562.00	63,132.16	10,000.00	62,565.66	11,195.06	38	7	Grading and surfacing.
Do	Carigara–Capoocan Road	6.0	215,078.00	25,000.00	25,000.00	24,995.69	24,995.69	12	12	Grading and temporary structures.
Do	Pastrana–Palo Road via Santa Fe.	6.5	86,929.00	35,000.00	10,000.00	34,319.81	10,705.30	39	12	Grading and surfacing.
Do	Alangalang–San Miguel Road	8.9	113,194.00	20,000.00		19,750.93	18,734.81	17	16	Grading and temporary bridges and culverts.
Do	Cabalian–Hinundayan Road			43,310.00	28,310.00	35,189.12	23,899.69			Grading and surfacing.
Do	Malitbog–Sogcd Road			15,000.00	10,000.00	14,776.49	9,923.26			Do.
Do	Tanawan–Tolosa–Dulag Roads.	20.6		50,772.00	24,876.00	43,371.17	29,810.20			Surfacing and temporary bridges.
Do	Hinunangan–Hinundayan Road	9.5		15,000.00		14,991.42	10,069.88			Surfacing and temporary bridges and culverts.
Marinduque	Santa Cruz–Torrijos–Malbcg Road.			218,137.36	17,562.00	216,448.70	17,692.81			Grading and surfacing.
Do	Mogpog–Santa Cruz Road			75,010.26	45,650.00	67,304.39	37,944.13			Grading.
Masbate	Masbate–Dimasalang Road			170,318.19	77,291.11	161,856.61	68,829.53			Grading, surfacing temporary bridges and concrete culverts
Do	Milagros–Aroroy Road			31,577.91	30,745.97	31,119.74	831.94			Grading and surfacing.
Mindoro	Calapan–Baco–San Teodoro Road.			10,500.00	10,500.00	10,277.24	10,277.24			Survey, grading and pipe culverts.
Do	Pinamalayan–Bongabon Road	35.3	432,361.00	19,696.00	17,705.98	19,377.91	17,387.89	5	4	Grading and reinforced concrete pipe culverts.
Do	Abra de Ilog–Mambusao Road			15,000.00	15,000.00	12,113.29	12,113.29			Survey, grading and temporary structure.
Mountain Province	Mountain Province–Nueva Vizcaya Interprovincial Road.	115.6		50,323.00	35,323.00	50,084.45	35,084.45			Survey and grading.
Do	Bontoc–Baguio Road	44.4		24,631.36	24,631.36	24,631.36	24,631.36			Grading and widening of trail.
Do	Mountain Province–Cagayan Interprovincial Road.	83.1		23,907.48	23,907.48	23,791.02	23,791.02			Survey and widening of trail.
Nueva Ecija	Talavera–Licab Road	18.4	164,000.00	162,952.20	5,200.00	162,674.00	5,526.78	99	4	Surfacing.
Do	San Jose–Santa Fe Road	50.8		1,539,913.57	30,000.00	1,537,710.22	31,432.98			Surfacing and concrete pipe culverts.
Do	Cuyapo–Nampicuan Road	6.1	70,069.00	49,184.67	9,474.35	49,164.91	9,644.81	70	15	Surfacing.
Do	Pinagpanaan–Rizal Road	25.7	273,617.00	170,633.36	30,300.00	168,682.07	33,335.42	62	12	Do.



DAVAO BRIDGE, DAVAO PROVINCE

TABLE VI—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1930—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure to December 31, 1930	Expenditure in 1930	Work accomplished		Remarks
								To date	During 1929	
		Kms.						P.ct.	P.ct.	
Nueva Ecija	Digdig–Carranglan Road	16.0	₱298,945.00	₱32,416.49	₱15,000.00	₱30,070.22	₱13,432.47	10	5	Grading and surfacing.
Do	Laur–Branch Road	9.1	65,225.18	65,225.18	22,146.87	65,225.18	22,530.46	100	34	Surfacing.
Do	San Jose–Rizal Road			19,108.06	5,007.25	19,107.06	5,135.21			Grading.
Do	San Leonardo–Papaya Road	6.2	75,411.00	13,838.88	1,229.89	13,838.88	1,277.09	18	2	Do.
Do	Cabanatuan–Bongabon Road	29.2	190,771.48	191,139.08	10,000.00	190,771.48	9,710.94	100	5	Surfacing.
Do	San Antonio–Jaen Road			5,000.00	5,000.00	4,979.18	4,979.18			Do.
Do	Bongabon–Baler Road			120,541.20	74.50	119,856.15	24,013.36			Grading.
Do	Muñoz–Lupao Road	17.7	477,876.00	44,186.05	18,000.00	39,124.22	14,931.67	8	3	Do.
Nueva Vizcaya	Bayombong–Nueva Ecija Boundary Road.	56.5		409,896.24	75,310.32	409,054.01	74,468.09			Widening and surfacing.
Occidental Misamis	Calamba–Baliangao Road	13.2	234,288.00	19,260.83	19,260.83	14,432.99	11,914.30	6	5	Grading and surfacing.
Do	Oroquieta–Plaridel–Dapitan Road.			110,334.27	30,000.00	106,824.97	41,750.40			Survey, grading and surfacing.
Do	Misamis–Zamboanga Interprovincial Road (Misamis section).			80,000.00	30,000.00	74,154.65	47,780.11			Grading, surfacing and temporary bridges and culverts.
Oriental Misamis	Catarman–Bonbon Road	10.6		26,056.60	10,000.00	25,520.80	9,464.20			Grading and temporary structures.
Do	Misamis–Lanao Interprovincial Road.	25.5		90,110.31	30,000.00	89,967.60	32,555.27			Grading, surfacing and temporary structures.
Do	Misamis–Agusan Interprovincial Road.			125,405.00	48,905.00	116,867.02	40,600.58			Widening, surfacing and temporary structures and concrete culverts.
Occidental Negros	Kabankalan–South Road			171,519.53	30,000.00	171,124.72	29,671.11			Grading, surfacing and temporary structures and culverts.
Do	Binalbagan–Isabela Road	13.3	94,203.74	94,415.63	1,000.00	94,203.74	1,110.54	100	8	Surfacing.
Do	Escalante–San Carlos Road			266,947.54	30,000.00	265,441.38	29,080.21			Do.
Do	Himamaylan–Carabalan Road			35,324.06	20,324.06	34,359.47	25,019.28			Grading, temporary structures and concrete pipe culverts.
Do	Binalbagan–Soledad Road			8,000.00		7,786.31	1,476.59			Surfacing.
Do	Sagay–Bulanon–Plaridel Road			9,500.00	5,000.00	9,486.12	6,210.13			Grading.
Do	Mabini–Rizal–Japitan Road			6,500.00		5,320.48	4,082.66			Do.
Do	Himogaan–Tiglawigan Road			6,000.00	4,000.00	5,855.36	5,134.06			Do.
Do	Silay Pier Road			16,000.00	16,000.00	2,644.44	2,644.44			Do.
Do	Kabankalan–Salong Road			7,000.00	7,000.00	6,892.50	6,892.50			Do.
Do	Isabela–Magallon Road			9,700.00	9,700.00	9,601.83	9,601.83			Do.
Oriental Negros	Guihulngan–Vallehermoso Road	34.2	521,740.00	176,480.98	30,000.00	176,303.75	29,882.77	34	6	Surfacing and temporary structures.
Do	Bais–Kabankalan Road			15,000.00	15,000.00	1,659.58	1,659.58			Survey.
Do	Bacong–Luzuriaga Road			13,642.00	13,642.00	13,505.79	13,505.79			Grading and temporary structures.
Do	Sibulan–San Antonio Road	5.5	82,604.00	10,000.00	10,000.00	6,722.22	6,722.22	8	8	Grading.
Do	Maria–Talingting Road	10.5		35,195.44	10,000.00	35,191.34	9,997.17			Surfacing and temporary structures.
Do	Dumaguete–South Road			104,761.72	29,877.00	98,214.43	23,352.65			Grading, surfacing and temporary structures.
Do	Dumaguete–North Road	117.0		598,445.00	10,000.00	598,330.87	9,945.81			Surfacing and temporary structures.
Palawan	Puerto Princesa–North Road	44.5	805,548.00	65,731.00	38,774.00	52,150.88	38,920.79	7	5	Grading and temporary structures and culverts.
Do	Puerto Princesa–South Road			112,860.29	13,914.46	96,734.46	16,373.60			Grading, surfacing and temporary structures and concrete culverts.
Pampanga	High School Road	0.5		14,000.00	14,000.00	13,789.59	13,789.59			Grading and surfacing.
Do	Concrete Road Pavement	25.8	850,000.00	866,792.40	866,792.40	843,555.54	70,278.88	100	13	Widening and laying concrete pavement.
Do	Arayat–Magalang Road	9.1	72,920.00	39,636.74	18,622.58	33,532.04	14,999.92	50	21	Grading and surfacing.
Do	Santa Rita–Porac Road	11.5	81,911.00	58,938.66	10,000.00	58,711.45	11,440.31	72	14	Do.
Pangasinan	San Carlos–Binmaley Road	14.2	106,463.95	106,490.12	16,019.60	106,463.95	15,993.43	100	7	Do.
Do	Villasis–Malasiqui Road	19.8	208,874.00	50,181.86	13,283.21	48,948.06	12,049.41	23	4	Do.
Do	Rosales–Santa Maria Road	14.5	256,369.00	53,568.56	22,628.08	48,847.66	17,907.18	19	7	Do.
Do	Urbiztondo–Mangatarem Road	4.3	268,267.00	30,000.00	20,512.05	29,999.41	20,511.46	11	8	Maintenance and repair of completed section.



BAGUIO-BONTOC ROAD, NEAR MOUNT DATA, MOUNTAIN PROVINCE

TABLE VI—ACTIVE ROAD CONSTRUCTION PROJECTS DURING 1930—Continued

Province	Name of project	Total length	Estimated cost	Appropriation to December 31, 1929	Appropriations in 1929	Total expenditure to December 31, 1930	Expenditure in 1930	Work accomplished		Remarks
								To date	During 1929	
		Kms.						P.ct.	P.ct.	
Pangasinan	San Fabian–Damortis Road	10.3	₱292,818.00	₱69,783.70	₱27,680.89	₱69,592.29	₱27,489.48	24	9	Grading and surfacing.
Do	San Carlos–Aguilar Road	10.3	364,166.00	37,369.42	24,512.08	30,764.60	17,907.18	8	5	Grading.
Rizal	Pililla–Quisao–Jalajala Road	16.0		52,089.88	9,281.09	51,697.59	8,888.80			Surfacing.
Do	Taft Avenue Extension	3.3	163,805.31	165,033.94	59,918.82	163,805.31	58,690.19	100	28	Grading and surfacing.
Do	Calle España Extension	1.6	140,950.00	90,000.00	87,828.50	63,887.67	61,716.17	45	44	Grading.
Do	Rizal–Laguna–Interprovincial Road.	9.5	168,913.00	137,442.18	34,295.85	134,765.74	31,619.41	80	19	Do.
Romblon	Carmen–Odiongan–Alcantara Road.			433,693.30	75,198.00	413,985.05	57,147.36			Grading, surfacing and culverts.
Do	San Fernando–Cajidiocan–Magallanes Road.	52.5	646,533.00	73,993.44	12,800.00	73,783.37	17,224.90	11	3	Grading.
Do	Badajoz–Carmen Road			28,000.00	18,000.00	14,608.18	16,519.58			Grading, surfacing and temporary structures.
Samar	Catbalogan–Taft Road	98.3	1,910,675.00	468,010.47	43,334.68	468,805.95	60,308.05	25	3	Grading and surfacing.
Do	Sulat–Oras	45.5		104,118.29	10,280.00	104,159.95	10,321.30			Surfacing and bridge approaches.
Do	Lavezares–Carangian Road	21.3	418,894.00	48,880.00	15,730.00	43,292.82	10,239.73	10	2	Grading and surfacing.
Do	Calbayog–Tinambacan Road	3.4	59,270.00	25,795.55	13,795.55	18,808.48	7,477.58	32	12	Grading and temporary structures.
Do	Oquendo–Catarman Road			74,000.00	49,000.00	61,944.85	89,112.29			Grading and surfacing.
Do	San Julian–Del Remedio Road	12.1	268,115.00	21,000.00	1,000.00	20,902.07	2,546.05	8		Construction of causeway.
Do	Basey–San Antonio Road	10.4	108,932.00	62,000.00	29,164.00	40,127.21	20,042.80	87	18	Grading and temporary bridges and culverts.
Do	Balangiga–Hiporlos Road	7.3	102,410.00	5,000.00	5,000.00	4,812.58	4,812.58	5	5	Grading.
Do	Palapag–Laoang Road			10,000.00	10,000.00	9,848.58	9,848.58			Do.
Do	Samar–Leyte Interprovincial Road.			49,000.00	49,000.00	48,985.83	48,985.83			Survey and grading.
Do	Borobaybay–Urdaneta Road			5,000.00	5,000.00	4,260.55	4,250.55			Construction of rock causeway.
Sorsogon	Putiao–Pilar–Donsol Road	30.1		97,811.00	19,000.00	89,763.40	26,679.59			Grading and surfacing.
Do	Gate–Matnog Road	17.2	265,285.00	49,006.00	20,000.00	32,688.77	9,168.66	12	3	Do.
Do	Juban–Magallanes Road	24.9	312,337.00	60,000.00	20,000.00	59,085.89	20,601.95	19	6	Do.
Sulu	Jolo–Taglibi Road	12.9	194,757.00	84,043.70	20,417.14	83,989.14	20,362.58	43	10	Do.
Do	Jolo–Tandu Batu Road	35.0	211,493.00	164,846.24	59,194.00	157,556.34	72,353.76	75	34	Do.
Do	Parang–Indanan	11.0	148,791.00	17,998.32	10,000.00	17,980.93	9,982.61	11	7	Grading, surfacing and temporary structures.
Surigao	Placer–Bacuag–Gigaquit Road	26.2	297,375.70	298,065.48	31,036.00	297,375.70	31,389.89	100	11	Surfacing and temporary bridges and concrete pipe culverts.
Do	Carrascal–Cantilan–Lanuza Road.	30.3	1,224,666.00	163,588.19	56,016.00	160,502.09	52,929.90	13	4	Grading, surfacing and temporary structures.
Do	Lianga–Hinatuan Road			15,000.00	15,000.00	14,472.72	14,472.72			Grading and pipe culverts.
Tarlac	Victoria–Pura–Ramas Road	11.2	135,618.00	25,000.00	5,000.00	19,450.96	697.64	14	1	Surfacing and concrete pipe culverts.
Do	Tarlac–Camiling Road	21.8	185,000.00	181,776.80	18,107.25	181,747.40	23,948.16	98	12	Surfacing.
Do	La Paz–Victoria Road	15.1	208,252.00	29,000.00	22,000.00	26,946.50	26,946.50	13	13	Grading and surfacing.
Do	La Paz–Concepcion Road	17.8	316,177.00	20,000.00	20,000.00	6,868.28	6,868.28	2	2	Grading.
Do	La Paz–Zaragoza Road	2.0	44,598.00	16,400.00	16,400.00	10,115.10	10,115.10	23	23	Do.
Tayabas	Tayabas–Pagbilao Road			39,593.30	15,500.00	39,493.19	15,841.20			Surfacing.
Do	Lucena–Dalahican Road			54,004.91	27,004.91	54,004.91	26,980.97			Do.
Do	Tayabas–Camarines Norte Interprovincial Road.			156,603.55	30,000.00	156,505.69	30,033.26			Grading, surfacing and temporary bridges.
Do	Puerto Real–Infanta Road	11.8	175,517.00	72,309.94	9,000.00	68,495.53	8,930.81	39	5	Grading, surfacing and temporary structures.
Do	Talaba–Summit Road			9,192.06	9,192.06	9,062.02	9,062.02			Grading.
Do	Tiaong–Rosario Road			30,000.00	10,000.00	29,922.12	12,358.63			Grading and surfacing.
Do	Baler–Bongabon Road			113,915.21	30,000.00	112,543.71	28,628.50			Do.
Do	Gumaca–Pitogo Road	22.7	394,377.00	275,857.75	54,804.00	265,857.75	44,818.27	67	11	Surfacing.
Do	Tayabas–Sambat–Mainit Road			13,393.65	8,009.37	18,939.55	8,892.09			Grading and surfacing.
Do	Sariaya–Mamala Road	5.2	67,059.00	4,500.00	4,500.00	4,486.32	4,486.32	7	7	Grading.
Do	Sumulong–Guinayangan Road			35,000.00	20,000.00	35,578.09	31,902.01			Do.
Zambales	Zambales–Bataan Interprovincial Road.	22.2		252,912.35	65,000.00	248,655.84	61,776.91			Grading, surfacing and culverts.
Do	Palauig–Matalvis Road	12.9	105,865.46	105,872.00	10,000.00	105,865.46	10,018.97	100	10	Surfacing.
Do	Iba–South Road	81.4		127,607.63	18,000.00	127,566.15	17,992.31			Do.
Do	Iba–North Road	64.4		15,358.00	15,358.00	10,794.46	10,794.46			Grading and surfacing.
Zamboanga	Misamis–Zamboanga Interprovincial Road (Dapitan–Plaridel Section).			111,736.19	30,000.00	104,170.27	22,728.47			Do.
Do	Bolong–Buenavista Road			135,470.32	19,050.00	135,368.43	21,591.41			Do.
Do	Misamis–Zamboanga Interprovincial Road (Pagadian–Misamis Section).			80,000.00	30,000.00	76,235.03	47,063.71			Grading.
Do	Isabela–Lamitan Road			142,330.00	62,488.00	125,428.87	48,576.93			Grading, surfacing and temporary structures.

BRIDGES

The following are the more important bridges completed during the year:

Orion River Bridge, Bataan Province.—This is a two 8-meter span reinforced concrete slab and girder bridge located at Km. 138 on the Balanga–South Road. The construction was undertaken by the International Construction Works, Inc. and was finished on December 4, 1930. At the close of the year, the approaches were under construction by "paquiao" contract of Mr. Buenaventura Paguio.

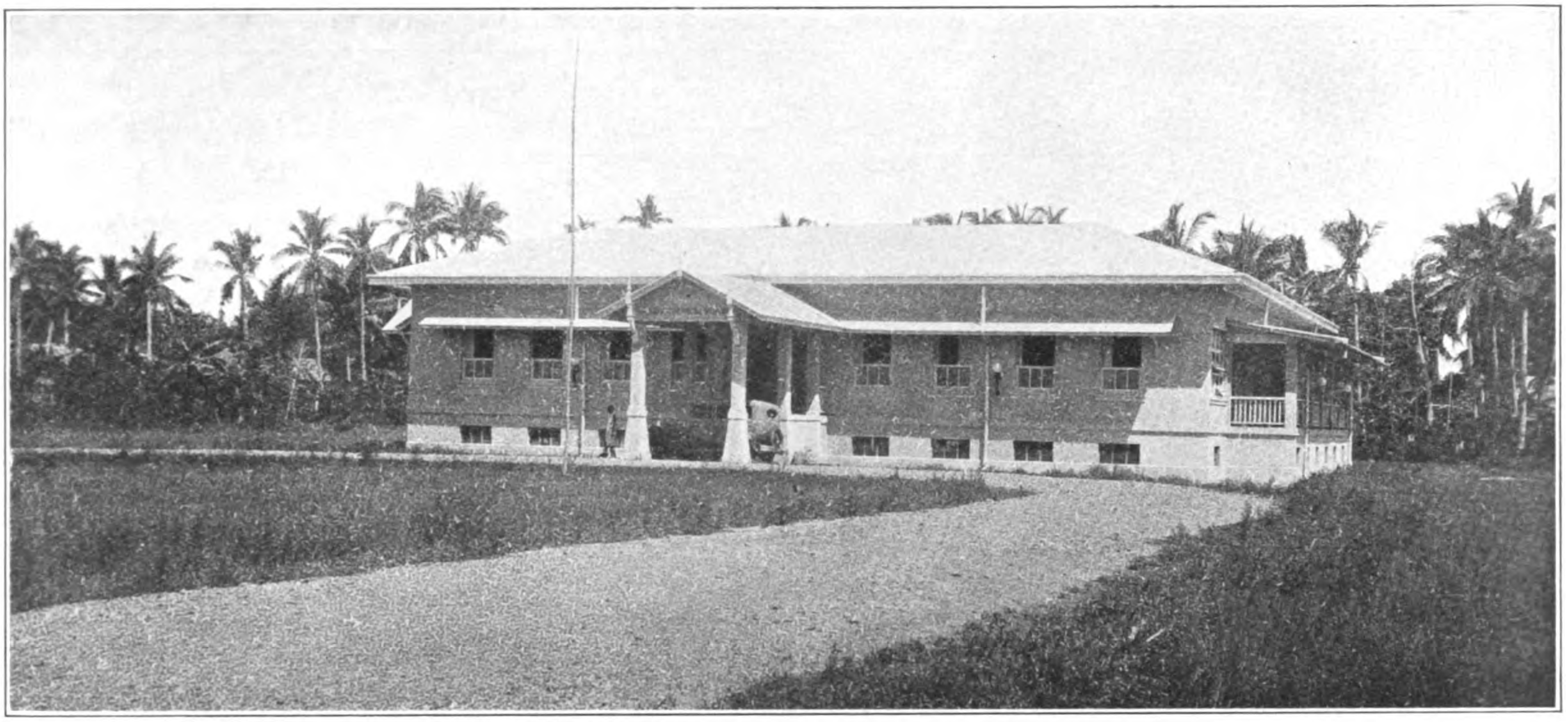
Talisay River Bridge, Bataan Province.—This is a nine 9-meter span reinforced concrete slab and girder bridge located at Km. 131 of the Balanga–South Road. It was completed on February 28, 1930.

Linauan River Bridge, Camarines Norte Province.—This is a two 8-meter span reinforced concrete slab and girder bridge located at Km. 11 of the Daet–Basud Road. It was completed during the early part of the year.

Bangon River Bridge, Cebu Province.—This is a 16-meter reinforced concrete arch bridge located at Km. 118 of the Cebu–North Road. The work was undertaken by the Butuan Saw Mill, Inc., Cebu and was finished during the early part of the year.

Inayagan River Bridge, Cebu Province.—This is a 100-foot steel truss bridge on reinforced concrete abutments resting on timber piles located at Km. 16 of the Cebu–South Road. It was contracted by Mr. C. Russell, and finished about the middle of September.

Davao River Bridge, Davao Province.—This bridge consists of three 150-foot steel truss spans on concrete abutments across the Davao River and is located at Km. 1 of the Davao–South Road. The contract for this work was awarded to Mr. C. V. Powers of



PROVINCIAL HOSPITAL, CALIVO, CAPIZ PROVINCE

Dumaguete, Oriental Negros. This bridge was opened to traffic on September 14. A temporary wooden approach was constructed at the south end. With the completion of this bridge, the transportation of products from the agricultural regions especially from the interior of the province to the port of Santa Ana is greatly facilitated.

Urzadan River Bridge, Ilocos Sur Province.—This bridge consists of two 7-meter reinforced concrete slab and girder spans and one 48.77-meter steel truss span and is located at Km. 377 on the Tagudin–Cervantes Road. The construction was contracted by Tan Samco of Manila for ₱54,850. Traffic on this bridge was opened on June 17, 1930. By virtue of Resolution No. 582 of the Honorable Provincial Board of Ilocos Sur, this bridge was named the "Diego Silang Bridge" in honor of an Ilocano patriot.

Cupang River Bridge, La Union Province.—This bridge consists of three 10-meter reinforced concrete slab and girder spans, and is located at Km. 262 on the Camp One–Aringay Road. The contract was awarded to Mr. Sakuso Kawaguchi for ₱17,500 to be completed within 90 calendar days. The work was started on March 14, and was completed in July, 1930. A sixty-day extension of time was allowed the contractor due to delay caused by heavy rains, scarcity of labor during the contract period and testing of the bearing power of the soil under the piers and abutments. The bridge was opened to traffic on August 9, 1930.

Talabaan River Bridge, Occidental Negros Province.—This bridge consists of one 120-foot steel truss span and is located at Km. 62 of the Bacolod–North Road. It was completed and opened to traffic during the early part of the year.

Tarlac River Bridge, Tarlac Province.—This bridge consists of three 150-foot steel truss spans on reinforced concrete abutments and piers of steel cylindrical shells $\frac{5}{8}$″ thick with timber piling foundation. The construction was constracted by Mr. Marion E. Martin of Manila for ₱112,000 to be completed within 305 calendar days. The work was completed on May 15, which was almost one month ahead of the contract time. This bridge is at Km. 135 on the Tarlac–Camiling Road. Its completion has made it possible for traffic to pass over Tarlac–Camiling Road throughout the year.

The following tabulation gives a description and the status of all bridge projects fully or partly completed during the year:

REINFORCED CONCRETE STRUCTURES IN EXISTENCE

Year	Total number	Total span, meters
1915	3,690	14,416
1916	3,973	15,297
1917	4,138	16,420
1918	4,238	18,672
1919	4,276	16,714
1920	4,302	16,938
1921	4,314	17,280
1922	4,366	17,684
1923	4,400	18,045
1924	4,428	18,413
1925	4,575	18,894
1926	4,597	19,236
1927	4,653	19,664
1928	4,709	20,264
1929	4,882	20,456
1930	5,001	21,152

NOTE.—All reinforced concrete structures were built under American Administration, together with a large number of steel and other classes of construction.

DURABLE BRIDGES AND CULVERTS IN EXISTENCE

Year	All durable structures	
	Total number	Increase during year
1915	6,640	484
1916	7,156	516
1917	7,370	214
1918	7,426	54
1919	7,491	65
1920	7,521	30
1921	7,481	[a]40
1922	7,562	81
1923	7,586	24
1924	7,613	27
1925	7,779	166
1926	7,753	[a]26
1927	7,831	78
1928	7,898	67
1929	8,049	151
1930	9,156	107

[a] Decrease.

NOTE.—The term "durable bridges and culverts" includes structures of reinforced concrete, steel, brick and all substantial stone structures whether of adobe or other material. The increase of 107 structures includes those actually completed during the year, as well as those which should have been previously reported, minus structures reported missing for the first time. The above figures are obtained from semi-annual reports of district engineers.

TABLE VII.—PERMANENT BRIDGES PARTIALLY OR COMPLETELY CONSTRUCTED DURING THE YEAR 1930

Province	Name	Bridge No.	Road	Type	Span in meters	Width of roadway	Estimated cost	Total expenditures to December 31, 1930	Expenditures in 1930	Work accomplished	
										To date	During 1930
						Meters				*Per cent*	*Per cent*
Albay	Agus River	53.3	Camarines Sur-Albay Road.	Steel truss	2-36.58	5.50	₱103,000.00	₱15,498.39	₱15,498.39	25	25
Bataan	Orion River	138.3	Balanga-South Road	Concrete slab. and girder.	2-8.0	[a] 6.00	25,500.00	21,192.52	21,192.52	100	100
Do	Talisay River	130.6	do	do	9- 9.0	5.50	58,000.00	58,017.30	23,037.72	100	40
Cagayan	Pared River	35.1	Cagayan Valley Road	Steel truss	3-48.77	5.50	278,500.00	102,912.51	102,912.51	....	....
Do	Bobogan River	24.6	Tuguegarao-Alcala Road	do	1-45.72	5.50	81,100.00	56,405.55	56,405.55	35	35
Camarines Norte	Linanan River	10.5	Daet Basud Road	Concrete slab and girder.	2- 8.0	5.50	20,000.00	16,809.17	3,699.88	100	10
Capiz	Ivisan River	15.5	Capiz-South Road	do	1-12.0	[a] 6.00	15,400.00	12,968.90	12,968.90	80	80
Cebu	Bangon River	117.8	Cebu-North Road	Concrete arch.	1-16.0	5.50	25,000.00	28,235.63	7,792.04	100	40
Do	Inayagan River	15.5	Cebu-South Road	Steel truss	1-30.48	4.85	31,500.00	26,907.40	26,907.40	100	100
Do	Daanbantayan River	....	Cebu-North Road	Concrete slab and girder.	3- 9.0	5.50	25,500.00	5,389.48	5,389.48	12	12
Davao	Talomo River	7.6	Davao-South Road	Steel truss	1-24.38 1-30.48	5.50	38,500.00	2,298.12	2,298.12	6	6
Do	Davao River	1.0	do	do	3-45.72	4.88	175,000.00	175,301.66	131,930.49	100	60
Ilocos Sur	Urzadan River	376.9	Tagudin-Cervantes Road.	Concrete slab and girder and steel truss.	2- 7.00 1-48.77	4.88	65,400.00	64,344.39	64,344.39	100	98
Iloilo	Lamonan River	0.90	Passi-Calinog Road	Steel truss	1-30.48	4.88	51,700.00	32,814.42	1,338.57	55	55
Do	Tigbauan River	23.08	Iloilo-South Road	Concrete slab and girder.	10- 9.0	[a] 6.00	76,700.00	3,136.20	3,136.20	16	16
Do	Jalaur River	40.4	Pototan-Barotac Road	Steel truss	3-39.62	4.88	168,600.00	16,325.74	18,325.74	21	21
La Union	Amburayan River	356.2	Manila-North Road	do	5-48.77	5.50	296,000.00	39,389.97	39,389.97	17	17
Do	Cupang River	261.9	Camp I-Aringay Road	Concrete slab and girder.	3-10.0	5.50	24,200.00	20,058.95	20,058.95	100	100
Nueva Ecija	Peñaranda River	96.7	Manila-North Road	Steel truss	6-45.72	5.50	272,400.00	145,268.00	145,268.00	74	74
Occidental Negros	Talabaan River	62.0	Bacolod-North Road	do	1-36.58	4.88	69,000.00	46,067.08	9,233.72	100	20
Do	Sangay River	77.7	do	Concrete slab and girder.	3-11.0	5.50	42,800.00	25,886.31	25,886.31	76	76
Oriental Misamis	Cagayan River	0.1	Cagayan-West Road	Steel truss	4-48.76	[a] 5.50	273,500.00	92,566.06	92,566.06	45	45
Pangasinan	Dungon River	....	Pangasinan-Benguet Road.	Concrete slab and girder.	3-12.00	5.50	37,500.00	5,184.71	5,184.71	18	18
Do	Paitan River	285.1	Lingayen-Alaminos Road.	Steel truss	1-48.76	5.50	60.000.00	10,890.32	8,111.69	....	....
Tarlac	Tarlac River	134.9	Tarlac-Camiling Road	do	3-45.72	5.50	162,000.00	142,024.75	56,249.73	100	37.2
Zambales	Cabangan River	24.6	Iba-South Road	do	2-36.58	5.50	70,000.00	68,159.23	68,159.23	90	90

[a] With sidewalk.

Camarines Norte-Sur Road under construction

BUILDINGS

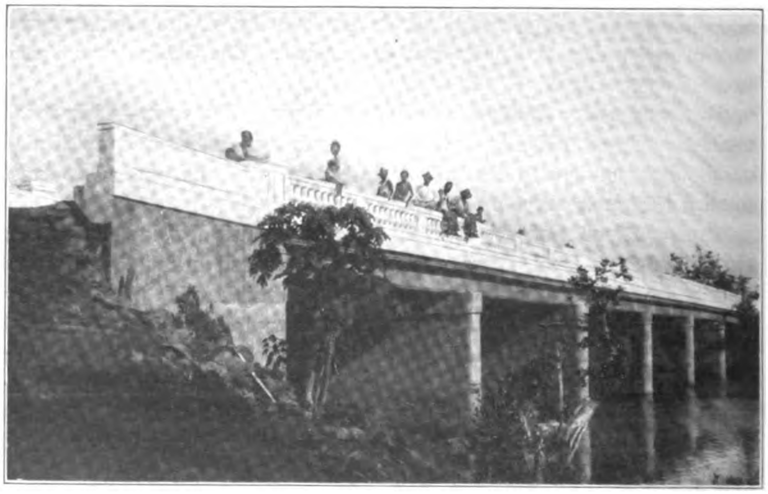
MANILA

The following are the more important insular buildings under construction during the year:

Reconstruction of Malacañang Palace.—This project involved the reconstruction of the east wing of Malacañang Palace which was antiquated and entirely unfitted for the requirements of a residence for the Governor-General. Also the timber of a number of the trusses had become so badly deteriorated that the building was becoming unsafe. The old adobe walls were demolishhed and replaced by reinforced concrete walls, inclosing four bedrooms, a courtyard and servants' quarters. A tile roof was provided to correspond with the wing on the West side. The work accomplished not only greatly improved the appearance of the building but also rendered it decidedly more habitable.

Bureau of Science Laboratory Building (Left Wing).—The Bureau of Science Laboratory Building (left wing) is a two-story concrete building with a basement. It has a total outside length of 75.90 meters, a front width of 15.60 meters and a rear width of 17.55 meters. The basement floor area is about 772.9 square meters. The structure has flat G. I. roofing, and the interior partition are of concrete and xylolith boards, the latter being imported from Germany purposely to be used in this edifice. This is the first government building to ever use this kind of material for partitions. The contract price for completing this project is ₱181,000 excluding electrical and plumbing work. At the end of the year 1930, the building was about 95 per cent completed, and the contractor expects to complete it by the middle of January, 1931.

Rear Wing, Rizal Hall, University of the Philippines.—This is a three-story concrete building on wooden pile foundation measuring 31.05 x 16.10 x 20.67 meters. The partitions are mostly plastering



Danao River Bridge, Occidental Negros Province on wooden framework. The building was completed on November 29, 1930, the approximate cost to the Government being ₱123,700. The foundation alone cost ₱11,000, which was done by administration.

Manila Post Office.—This is a 5-story concrete building on wooden piles measuring 50.92 by 121.47 meters out to out. The approximate cubical content of the building is 127,000 cubic meters. The foundation alone costs ₱510,000. The building was about 98 per cent completed at the end of 1930 and is expected to be finished in March, 1931. When finished, the whole building, ground improvement and electrical fixtures and equipment, will cost approximately ₱3,000,000. This building will house the Bureau of Posts and the Department of Commerce and Communications. The public lobby has granolithic floors, marble wainscoting, and highly artistic ceiling.

Library, University of the Philippines.—This is a 3-story concrete building on wooden pile foundation measuring 41.00 x 33.96 x 17.93 meters. The building was completed on October 2, 1930, costing the Government approximately ₱430,000. The ceiling of the reading room compares favorably with that of the public space of the Manila Post Office which is highly artistic.

PROVINCES

Construction of a large number of public buildings was undertaken in the provinces during the year, the most important of which are the following:

Mansion House, Baguio.—This project consists of the alteration and reconstruction of the old building and the construction of two 1-story two-wing additions to the main building. The alteration and reconstruction were completed on March 31. The construction of the additions which is being undertaken by contract to be completed within 115 days from November 19 was 20 per cent completed at the close of the year. The sum of ₱180,000 was appropriated under Act 3597 for this project.

Bauan Presidencia, Batangas Province.—This is a one-story concrete building of special design, with a central pavilion and two wings. The construction of the building is under contract by Tan Chiao Tee and Co. for ₱47,000. The work was 40 per cent completed at the close of the year.

Bulacan Provincial Capitol, Bulacan Province.—This is a three-story concrete structure with wings and passageway embracing the old Trade School Building, which is to be remodeled into a courthouse. The contract for the construction of the central portion without the wings was awarded to Gotauco & Co. for ₱180,887. Actual construction work started on March 6, 1930 and at the close of the year the building stood about 99 per cent completed. The contract time expired on November 11, 1930, but the Provincial Board, upon recommendation of the District Engineer, granted 50 days extension of time. The wings and the remodeling of the Trade School Building are being undertaken by the Mariquina Valley Construction Co. for ₱100,000. This part of the work was 41 per cent completed at the close of the year. The electrical wiring will be installed by Cacho & Hidalgo for ₱4,998.

Calatrava River Bridge, Province of Occidental Negros

Ursadan River Bridge, Tagudin–Cervantes Road, Ilocos Sur Province

Southern Island Hospital Extension, Cebu Province.—The contract work for the construction of this extension was awarded to Mr. T. Medecielo for ₱61,461 to be completed within 300 calendar days. The work was started in September and at the close of the year it was about 33 per cent completed.

Vigan Provincial Capitol, Ilocos Sur Province.—This project consists of the reconstruction and remodeling of the old masonry brick building and the construction of two additional wings. The construction of the two wings was undertaken by contract for ₱98,400, and was finished on May 31, 1930, and occupied on June 2, 1930. The electrical work was done by Mora Electrical Co. for ₱2,250. The work of constructing the main portico is now being undertaken by administration and is expected to be finished by March, 1931.

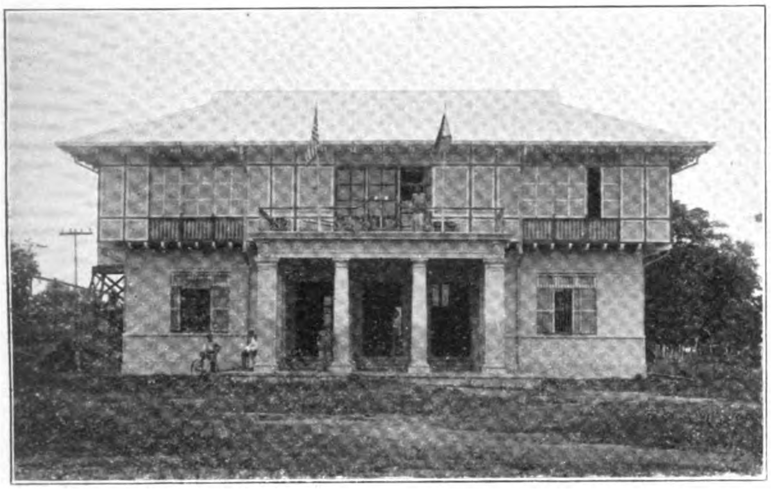
Provincial Capitol Building, Occidental Negros Province.—The construction of this building was originally contracted by Mr. M. S. Concepcion of Manila. It was abandoned by him, so it was completed by administration. The building was practically completed at the close of the year. The total expenditures for this project amounted to ₱369,874.48 at the end of the year.

Bacolod High School Building, Occidental Negros Province.—The contract for the construction of this building was awarded to Mr. Ong Kim of Iloilo, Iloilo, for the sum of ₱110,000 to be completed within 250 days. The work was only about 7 per cent completed at the close of the year. It was started about the middle of November.

Pampanga Provincial Hospital, Pampanga Province.—This is the construction of a 30–50 bed hospital. The labor was contracted by Mr. Pedro C. Tan for ₱23,000, and the materials were furnished by the Government. The work was completed at a cost of ₱110,245.05.

Pampanga Provincial High School, Pampanga Province.—This is a Pampanga type modeled after B. E. Standard Plan No. 20. The construction of the building was contracted by Mr. Pedro C. Tan for ₱97,000, excluding the three rear rooms, the ground concrete floor and the girl's toilet. The work was not completed within the specified time so an extension from February 15, 1930, to August 7, 1930, was granted the contractor. As the completion of the building was further delayed, the cancellation of the contract was recommended but so far no action has been taken by the Provincial Board. The building which is 95½ per cent completed is expected to be finished in February, 1931.

Assembly Hall, Lingayen High School, Pangasinan Province.—This is a special plan of Assembly Hall Building. The first floor provides for an auditorium, stage, offices, storeroom, library, toilets, lobby



Municipal Building, Binalbagan, Occidental Negros

and corridor, and the second floor provides for alleys, balconies and corridors. Its principal outside dimensions are 37.0 x 37.0 meters. The work including the electric light wiring and fixtures is being done by contract for ₱213,400. This project was 99 per cent completed at the close of the year.

Addition to Pasig Capitol Building, Rizal Province.—The work, which is under contract by Gotauco & Co. of Manila for ₱214,900 includes the complete construction of the central portion and east wing and some alterations in the old building. The electrical installation is contracted by Elmac, Inc. of Manila for ₱6,400. At the close of the year, the building was 72 per cent completed. This work is expected to be finished about the middle of April, 1931.

Romblon Provincial Building, Romblon Province.—This building is of the Cotabato type. Its principal dimensions are 12.80 x 38.20 meters. The estimated cost is ₱54,000. The work was started in October and at the close of the year, it was about 35 per cent completed.

Sariaya Presidencia Building, Tayabas Province.—The municipality of Sariaya is now constructing a new presidencia building, as the present one has been found inadequate for the needs of the municipality. The work is under contract by Mr. Gregorio Malinis of Lucena, Tayabas, for ₱59,500, the Government to furnish him at the site, free of charge, 1,100 barrels of tested cement. Construction was started on October 23, 1930, and is to be completed within 240 calendar days. At the close of the year, the building was 15 per cent completed. To finance this project the municipality obtained an insular loan of ₱80,000, ₱2,000 of which has been set aside for the acquisition of the building site.

Table VIII gives a complete list of the school buildings constructed during the year, with their cost and principal dimensions.

Table IX shows the hospital buildings constructed during the year with their cost and principal dimensions.

Table X is a tabulation of market buildings and tiendas constructed with their cost and principal dimensions.

Table XI is a tabulation of presidencia buildings constructed with their cost and principal dimensions.

Table XII is a statement of miscellaneous buildings undertaken during the year.

Table XIII shows the number of durable buildings constructed every year since 1921, and their total cubical contents and costs.

TABLE VIII.—SCHOOLS

Province	Municipality	Buildings	Types and materials used	Principal dimensions	Total contents	Cost
				Meters	*Cubic meters*	
Abra	Peñarubia	1	Rubble, brick and constructed with G. I. roof	36.15× 18.65× 7.00	2,594.0	₱7,999.53
Do.	Lagangilang	1	Concrete with G. I. roof	11.70× 17.60× 5.20	2,192.0	21,933.12
Do.	Bangued	1	Concrete with G. I. roof (Pasig type)	15.16× 11.32× 5.20	1,826.0	20,079.59
Agusan	Butuan	Additional rooms	Concrete and wood with G. I. roof (semipermanent.)	14.00×11.00	1,048.6	4,450.23
Do.	Banawan	1	Concrete wood with G. I. roof	28.00×12.00	2,318.9	13,068.30
Albay	Sabang, Oas	1	Concrete and wood with G. I. roof (semipermanent.)	12.00× 14.20× 8.35	1,243.0	7,982.58
Do.	Malilipot	1	Concrete with G. I. roof	12.25× 21.20× 8.25 11.70× 14.20× 8.25	3,601.0	23,727.88
Do.	Oas	1	Concrete and wood with G. I. roof (semipermanent.)	11.20× 21.10× 8.35	1,704.0	8,881.02
Do.	Mauraro, Guinobatan	1	do	9.20× 18.20× 8.60	2,256.0	5,995.44
Do.	Guinobatan	1	Concrete with G. I. roof	12.25× 14.15× 8.25	1,218.0	9,528.20
Do.	Cabasan, Bacacay	1	Concrete wood with G. I. roof	9.20× 18.20× 7.20	1,147.0	4,987.03
Do.	Joroan, Tiwi	1	do	9.20× 18.20× 7.20	1,147.0	4,944.19
Do.	Catmon, Camalig	1	do	9.20× 18.20× 7.20	1,147.0	4,996.53
Do.	Higmoto, Baras	1	do	9.20× 18.20× 7.20	1,147.0	6,001.17
Do.	Bubulusan, Guinobatan	1	do	9.20× 9.20× 7.20	579.8	2,990.05
Do.	Bacacay		Concrete with G. I. roof	7.00× 12.25× 8.15 7.10× 11.70× 7.96	1,214.9	9,005.90
Do.	Ponso, Polangui	1	Concrete wood with G. I. roof	12.20× 28.20× 7.75	2,468.5	11,438.00
Do.	Daraga	Domestic Science	do	11.20× 17.20× 7.45	1,310.0	11,805.39
Do.	Pañganiban	1	do	12.20× 28.20× 7.75	2,468.5	12,136.35
Do.	Viga	1	do	12.20× 14.20× 7.75	1,243.0	6,904.16
Antique	Culasi	1	Concrete and wood with G. I. roof (semipermanent.	10.50× 27.00× 7.55	1,837.7	10,704.07
Do.	Sibalom	Additional rooms	do	24.90× 50.00× 8.18	4,048.9	20,988.27
Do.	do	1	Concrete wood with G. I. roof	42.00× 11.00× 8.50	3,349.5	17,222.00
Do.	Quintas, San Jose	1	do	28.00× 12.00× 8.50	2,436.0	11,251.48
Do.	Tibiao	1	do	28.00× 12.00× 8.50	2,436.0	10,003.14
Bataan	Abucay	1	Concrete with G. I roof	12.25× 14.25× 9.50	1,431.4	9,973.39
Do.	Hermosa	1	do	12.25× 14.25× 8.90	1,326.7	9,926.09
Do.	Orion	1	do	12.25× 14.25× 8.90	1,326.7	9,745.38
Batanes	Mahatao	1	Rubble and wood with G. I. roof	25.40× 8.40× 6.60	1,386.8	10,037.89
Batangas	Lucsuhin, Calatagan	1	Concrete and wood with G. I. roof (semipermanent.	18.20× 9.20× 7.55	1,188.3	4,909.71
Do.	Botong, Taal	1	do	18.20× 9.20× 7.55	1,188.5	4,959.65
Do.	Talaga, Mabini	1	do	9.20× 9.20× 7.55	594.2	3,974.78
Do.	Balayan	1	Concrete with G. I. roof (Standard Plan No. 10-A)	2-24.90× 11.70× 8.80 28.00× 12.20× 9.00	6,913.5	44,245.70
Do.	Darasa, Tanauan	1	Concrete wood with G. I. roof	25.20× 9.20× 7.55	1,611.3	8,932.00
Do.	Ayu, San Jose	1	do	18.20× 9.20× 8.55	1,188.3	4,552.32
Do.	Wawa, Nasugbu	1	do	18.20× 9.20× 7.55	1,188.3	4,524.92
Do.	Tangab, Rosario	1	do	18.20× 9.20× 7.55	1,188.3	4,943.48
Do.	San Joaquin, Santo Tomas.	1	do	18.20× 9.20× 7.55	1,188.3	4,957.16
Do.	Bayuyungan, Talisay	1	do	18.20× 9.20× 7.55	1,188.3	4,888.62
Do.	Payapa, Malvar	1	do	18.20× 9.20× 7.55	1,188.3	4,821.79
Do.	Dita, Cuenca	1	do	23.20× 9.20× 7.85	1,429.0	3,969.04
Do.	Mojon, Alitagtag	1	do	14.15× 9.15× 6.55	812.0	3,101.05
Do.	Calansayan, Batangas	1	do	14.15× 9.15× 6.55	812.0	3,092.52
Bohol	Sikatuna	1	Concrete wood with G. I. roof (B. P. W. Standard School Plan).	14.00× 12.00× 8.50	1,218.0	5,979.17
Do.	Lila	1	do	10.50× 11.00× 8.33	962.1	5,198.94
Do.	Guindulman	1	do	14.00× 12.00× 8.50	1,218.0	3,460.90

TABLE VIII.—SCHOOLS—Continued

Province	Municipality	Buildings	Types and materials used	Principal dimensions	Total contents	Cost
				Meters	*Cu. meters*	
Bohol	Inabanga	1	Concrete with G. I. roof	11.72× 14.30× 7.75	1,697.5	₱12,481.97
Do.	Corella	1	....do	12.00× 14.00× 8.90	1,495.2	14,427.01
Do.	Bilar	Rural High	Concrete wood with G. I. roof	12.00× 14.00× 8.50	1,218.0	6,350.33
Do.	Dauis	1	Concrete with G. I. roof	7.60× 11.70× 8.21 7.00× 12.00× 8.40	2,058.9	14,887.08
Do.	Bilar	1	....do	12.00× 21.00× 8.90	2,242.8	11,834.44
Do.	Talibon	1	Concrete wood with G. I. roof	11.00× 7.00× 8.33	551.7	4,869.11
Do.	Panadtaran	1	....do	12.00× 7.00× 8.50	609.0	3,349.92
Bukidnon	Malaybalay	Vocational High School	Concrete and wood with G. I. roof	28.00×12.00	2,158.8	14,500.00
Bulacan	Obando	Extension	Concrete with G. I. roof (Standard Plan No. 7)	11.50× 7.00× 8.07	518.6	5,000.00
Do.	Pulilan	....do	Concrete and wood with G. I. roof (Standard dard Plan No. 7).	2-11.50× 7.00× 8.07	1,037.2	5,000.00
Do.	Mojon, Malolos	1	Concrete and wood with G. I. roof (Standard Plan No. 4-A).	9.20× 32.20× 7.00	2,092.5	6,000.00
Do.	Prenza, Marilao	1	....do	9.20× 18.20× 7.00	1,182.9	5,000.00
Do.	Marungco, Angat	1	Concrete wood with G. I. roof	9.20× 32.20× 7.00	2,092.5	10,575.31
Do.	Paombong	Domestic Science	....do	16.00× 7.00× 6.00	766.5	3,329.52
Cagayan	Rizal	1	Concrete and wood with G. I. roof (Standard Plan No. 10-A).	28.00× 12.15× 5.40	2,514.6	11,699.06
Do.	Pamplona	1	....do	28.00× 12.15× 5.40	2,514.6	13,246.72
Do.	Alcala	1	Concrete with G. I. roof (Standard Plan No. 10-A).	14.00× 12.25× 5.20	1,222.8	10,789.75
Do.	Buguey	1	....do	28.50× 12.25× 5.20 24.90× 11.70× 5.20	2,077.2	13,998.15
Do.	Claveria	1	....do	28.50× 12.20× 5.20	2,883.7	11,261.71
Do.	Faire	1	Concrete wood with G. I. roof	28.00× 12.10× 5.40	2,514.6	11,950.26
Camarines Norte	Labo	Extension	Concrete with G. I. roof (Plan No. 4)	7.00× 18.00× 7.70	852.8	6,824.64
Do.	Talisay	....do	Concrete and wood with G. I. roof	2-7.20× 9.20× 7.80	1,011.6	4,484.64
Do.	Indan	1	Concrete with G. I. roof (Plan No. 9)	21.50× 12.25× 7.70	1,896.5	14,689.17
Do.	Bagasbas, Daet	1	Concrete wood with G. I. roof	8.00× 14.00× 7.80	864.6	2,955.25
Camarines Sur	Naga	Additional rooms	Concrete with G. I. roof	17.90× 33.00× 9.03	3,590.8	22,890.12
Do.	Sagnay	....do	Concrete and wood with G. I. roof	11.50× 17.80× 8.88	1,640.0	8,007.48
Do.	Baao	Domestic Science	Concrete wood with G. I. roof	7.30× 14.20× 7.52	664.8	4,434.27
Do.	Catagbacan, Goa	1	....do	9.40× 18.40× 8.00	1,189.0	7,016.21
Do.	Pambuhan, Caramoan	1	....do	14.30× 12.30× 8.60	1,304.3	6,646.47
Do.	Paruboan, Lagonoy	1	....do	14.30× 12.30× 8.90	1,358.1	7,816.60
Do.	Salogon, San Jose	1	....do	14.30× 12.30× 8.60	1,304.3	7,251.73
Capiz	Sapian	1	Concrete and wood with G. I. roof	12.20× 21.20× 7.95	2,007.2	10,254.26
Do.	Mambusao	1	....do	12.20× 28.20× 7.95	2,662.6	13,599.27
Do.	Dao	1	....do	12.25× 28.50× 8.30	2,889.2	20,117.68
Do.	Pontevedra	Domestic Science	Concrete wood with G. I. roof	7.20× 12.70× 5.80	523.6	6,290.61
Do.	Libacao	1	....do	12.20× 21.20× 7.95	2,007.2	12,477.75
Do.	Ibajay	1	....do	12.25× 28.50× 8.30	2,889.2	20,082.85
Do.	Dumalag	1	....do	12.25× 28.50× 8.30	2,889.2	19,822.39
Do.	Panay	1	....do	11.20× 17.20× 8.20	1,558.4	15,046.65
Do.	....do	....do	....do	7.20× 12.70× 5.80	523.6	
Do.	Bañga	Rural High	....do	12.25× 28.50× 8.30	2,889.2	19,962.76
Do.	Dumarao	1	....do	12.20× 14.20× 7.95	1,357.8	6,632.06
Cebu	Olivo, Tuburan	1	Concrete and wood with G. I. roof	9.00× 9.00× 8.10	606.2	3,580.72
Do.	Poro	1	....do	12.00× 14.00× 8.60	1,176.7	5,852.04
Do.	San Fernando	1	Concrete with G. I. roof	12.00× 28.00× 8.40	2,236.5	19,535.42
Do.	Alcantara	1	Concrete and wood with G. I. roof	12.00× 14.00× 8.60	1,176.7	9,315.00
Do.	Moalboal	1	Concrete with G. I. roof	12.00× 14.00× 8.40	1,176.7	9,705.93
Do.	Cebu	Trade School	Concrete with G. I. roof (2 story)	11.25×135.33×14.70	9,019.3	102,398.78
Do.	Alcoy	1	Concrete wood with G. I. roof	11.00× 10.50× 8.60	868.5	17,885.83
Do.	Sogod	1	....do	11.00× 10.50× 8.60	868.5	10,462.40
Do.	Simala	1	....do	9.00× 9.00× 8.10	606.2	8,517.63
Do.	Alcantara	1	....do	12.00× 14.00× 8.60	1,176.7	14,074.06
Do.	Tayud	1	....do	9.00× 18.00× 8.10	1,189.9	3,811.97
Do.	Perrelos	1	....do	9.00× 18.00× 8.10	1,189.9	6,412.89
Do.	Tanke	1	....do	9.00× 18.00× 8.10	1,189.9	6,286.59
Do.	Lipata	1	....do	9.00× 18.00× 8.10	1,189.9	6,295.37
Do.	Maribago	1	....do	9.00× 18.00× 8.10	606.2	3,500.00
Do.	Bantayan	1	Concrete with G. I. roof	21.00× 11.20× 7.91	1,623.7	20,685.61
Do.	....do	Domestic Science	Concrete wood with G. I. roof	7.00× 18.40× 7.80	889.2	20,685.66
Cavite	Tanza	1	Concrete and wood with G. I. roof (Standard Plan No. 7).	35.00× 11.20× 5.65	3,096.8	20,339.88
Cotabato	Midsayap, Bual	Additional rooms	Concrete and wood with G. I. roof	12.00×14.00	1,104.5	3,999.46
Davao	Santa Cruz	....do	....do	11.00× 17.50× 6.00	1,381.0	12,174.66
Do.	....do	Annex	....do	11.00× 10.50× 6.00	828.8	
Do.	Digos, Santa Cruz	1	....do	9.00× 9.00× 6.00	602.5	3,709.72
Do.	Tugboc, Guianga	Domestic Science	Concrete wood with G. I. roof	6.00× 8.00× 4.80 3.00× 4.00× 4.80	343.8	2,601.76
Do.	Padada, Santa Cruz	1	....do	9.00× 9.00× 6.00	602.5	3,709.82
Do.	Digos, Santa Cruz	1	....do	9.00× 9.00× 6.00	602.5	3,709.72
Do.	Davao	1	....do	15.00× 7.00× 4.40	638.2	4,005.23
Ilocos Norte	Currimao	1	Concrete with G. I. roof (Compostela type)	18.00× 8.00× 3.80 14.00× 14.00× 3.50	1,088.6	18,590.04
Do.	Bacarra	1	Masonry concrete with G. I. roof	5.00× 9.50×46.50	2,621.0	1,879.61
Ilocos Sur	Cabugao	1	Stone and brick with G. I. roof	27.40× 14.10× 9.70	1,822.6	9,849.96
Do.	Santiago	1	Concrete wood with G. I. roof	14.15× 12.15× 7.96	1,308.1	9,474.16
Do.	....do	1	....do	7.00× 12.15× 7.95	648.6	
Do.	Panda, Caoayan	1	....do	21.15× 12.15× 7.95	1,917.9	9,888.41
Do.	Candon	1	Concrete with G. I. roof	14.40× 9.20× 7.60	986.9	4,716.01
Do.	Santa	1	....do	21.60× 12.25× 8.90	1,912.2	11,815.35
Do.	Narvacan	1	Concrete wood with G. I. roof	26.00× 16.00× 6.20	1,658.8	4,889.29
Iloilo	Dumangas	1	Concrete with G. I. roof (Standard Plan No. 10-a).	12.00× 28.00× 8.91 11.70× 35.00× 8.91	6,475.5	37,982.92
Do.	Iloilo	Additional rooms	Concrete with G. I. roof (B. E. Standard Plan No. 20).	2-11.80× 35.00× 8.75	6,229.8	36,236.77
Do.	La Paz	....do	Concrete with G. I. roof (Standard Plan No. 5)	9.20× 18.00× 7.69	1,154.4	7,556.63
Do.	Janiuay	....do	Concrete and wood with G. I. roof (Plan No. 10)	11.00× 14.00× 8.85	1,609.7	5,989.17
Do.	Oton	....do	Concrete with G. I. roof (B. E. Standard Plan No. 6).	11.50× 35.00× 8.16	3,735.8	22,546.08
Do.	Tigbauan	1	Concrete with G. I. roof (Standard Plan No. 10-a).	14.00× 12.00× 8.95 11.70× 17.60× 8.65	2,886.2	20,932.61
Do.	Lublub, Dumangas	1	Concrete with G. I. roof	9.20× 23.20× 7.69	1,846.2	9,966.40
Do.	Sara	1	....do	12.25× 21.00× 9.25	4,604.0	27,105.98
Do.	Calinog	1	....do	12.00× 14.00× 8.81	2,330.8	9,873.60
Do.	Jaro	1	....do	14.00× 12.00× 8.95	2,886.2	18,644.78
Do.	Zarraga	1	....do	14.20× 39.20× 7.40	3,242.8	23,990.38
Do.	Zaldicar, Buenavista	1	....do	7.20× 9.20× 7.50	395.0	4,670.62
Isabela	Casibarag, Cabagan	1	Concrete and wood with G. I. roof	9.20× 14.20× 7.91	863.6	6,981.71
Laguna	Pagsanjan	1	Concrete with G. I. roof (2 story)	12.80× 22.20×41.80	7,628.4	57,502.64
Do.	Nagcarlang	1	....do	11.00× 18.00×40.50	7,276.8	52,966.21
Do.	Alaminos	Additional rooms	....do	8.10× 11.00×21.30	1,687.0	10,282.93
Do.	Rizal	1	Concrete wood with G. I. roof	7.75× 13.50×36.00	1,954.0	12,078.14
Do.	Calauan	1	....do	6.85× 7.00×12.50	612.4	5,192.82
Do.	Paete	Additional rooms	....do	6.00× 9.00×10.65	504.2	4,548.19

MUNICIPAL BUILDING, CONCEPCION, TARLAC PROVINCE

TABLE VIII.—SCHOOLS—Continued

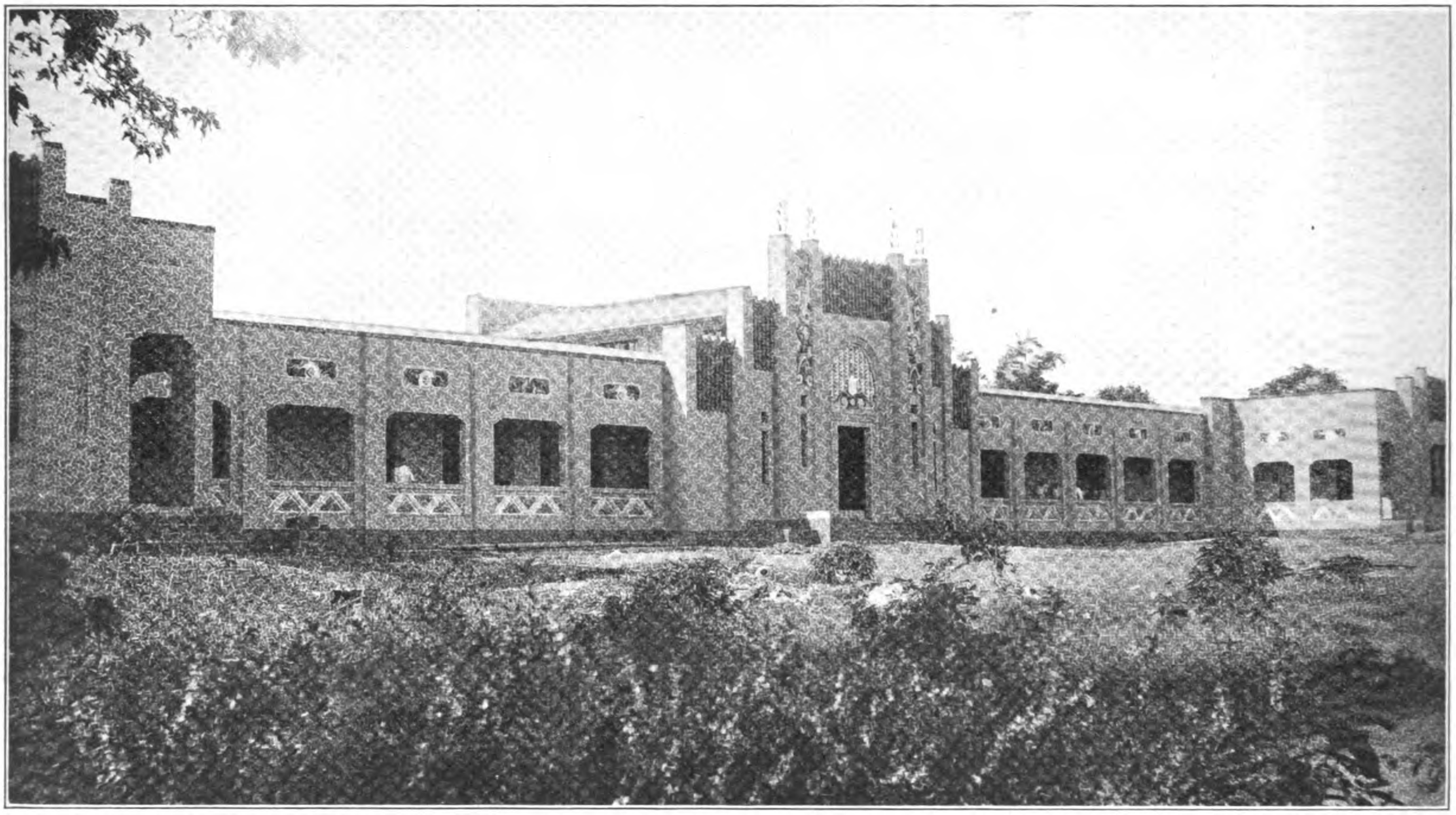
Province	Municipality	Buildings	Types and materials used	Principal dimensions	Total contents	Cost
				Meters	*Cu. meters*	
Laguna	Siniloan	Additional rooms	Concrete with G. I. roof	12.00× 21.00× 8.75	1,896.8	₱13,782.42
Do.	Bay	do	do	8.10× 9.00×23.00	1,745.1	14,179.35
La Union	Bitalag, Bacnotan	do	Concrete and wood with G. I. roof	9.15× 9.15× 8.15	583.9	3,608.01
Do.	Balaoan	do	Concrete with G. I. roof	7.60× 11.70× 8.96	733.8	4,022.74
Do.	Tubao	1	Concrete wood with G. I. roof	21.15× 12.15× 8.50	1,863.0	9,950.62
Do	Wenceslao, Caba	1	do	9.15× 9.15× 8.15	583.9	3,895.54
Do.	Lingsat, San Fernando	Additional rooms	do	9.15× 14.15× 8.15	870.4	6,878.34
Do.	Bangar	1	do	21.15× 12.15× 8.50	1,863.0	9,902.07
Do.	Santiago, Bauang	1	do	9.15× 9.15× 8.15	583.9	3,880.43
Leyte	Baybay	1	Concrete wood with G. I. roof	14.00× 12.00× 7.75	1,039.0	5,771.00
Do.	Macrohon	1	Concrete with G. I. roof	12.00× 7.00× 8.15	548.0	4,569.58
Do.	Burawen	1	do	11.70× 7.00× 7.96	529.0	5,957.67
Do.	Baybay	Agricultural School	do	11,70× 24.60× 7.96	2,463.0	19,546.97
Do.	La Paz	1	Concrete wood with G. I. roof	11.00× 10.50× 7.58	719.0	6,487.89
Do.	Hindang	1	do	11.00× 10.50× 7.58	719.0	5,853.51
Do.	Jaro	1	do	11.00× 24.50× 7.58 11.00× 31.50× 7.58	6,206.0	35,595.82
Do.	Alangalang	1	do	11.00× 24.50× 7.58	1,728.0	9,656.87
Do.	Palo	1	do	11.00× 17.50× 7.58	1,222.0	9,349.44
Do.	Tanauan	1	do	11.00× 17.50× 7.58	1,222.0	9,892.79
Do.	Abuyog	1	do	11.00× 10.50× 7.58	722.0	5,244.88
Do.	Panalaron, Tacloban	1	do	12.00× 21.00× 7.75	1,445.0	9,476.88
Do.	San Isidro, Malitbog	1	do	14.00× 12.00× 7.75	1,039.0	5,299.00
Manila	Padre Faura and Taft Avenue.	Rear wing, Rizal Hall, U. P.	Concrete with G. I. roof (3 story)	31.05× 16.10×20.67	8,793.9	123,733.80
Marinduque	Mogpog	Additional rooms	Concrete with G. I. roof	11.70× 17.90× 5.20	1,549.8	11,603.48
Do.	Buenavista	do	Concrete wood with G. I. roof	11.00× 17.50× 5.40	1,364.8	7,517.56
Masbate	Balud, Milagros	1	Concrete and wood with G. I. roof	18.00× 9.00× 5.00	955.8	5,818.00
Do.	Cataingan	1	do	29.00× 9.00× 5.00	1,629.9	9,454.00
Do.	San Jacinto	Annex	Concrete with G. I. roof	18.00× 7.00× 5.00	743.4	8,449.89
Mindoro	Pinagsabangan, Naujan	1	Concrete and wood with G. I. roof	9.20× 9.20× 5.00	582.3	3,130.58
Do.	Pinamalayan	1	Concrete wood with G. I. roof	12.20× 7.20× 5.40	629.4	3,234.15
Nueva Ecija	Talavera	1	Concrete and wood with G. I. roof	29.20× 40.40× 5.25	1,991.3	19,030.13
Occidental Misamis	Misamis	1	do	28.00×12.00	2,617.0	11,359.77
Do.	Tudela	2	Concrete wood with G. I. roof	12.00×28.00 11.00×10.50	3,102.6	16,400.00
Occidental Negros	Himamaylan	Extension	Concrete and wood with G. I. roof	11.00× 14.00× 8.05	1,024.1	7,524.63
Do.	Aguisan, Himamaylan	1	do	39.00× 17.50× 8.45	3,789.4	15,469.10
Do.	Silay	Extension	do	21.00× 11.80× 9.00	1,784.1	7,189.20
Do.	Tabao, La Carlota	1	do	14.00× 12.00× 7.75	1,104.6	5,954.80
Do.	Talisay	Extension	Concrete with G. I. roof	18.00× 9.20× 7.80	1,299.8	9,933.11
Do.	Victorias	do	do	9.00× 9.00× 7.41	487.7	2,920.63
Do.	Manapla	do	Concrete wood with G. I. roof	9.00× 14.00× 8.85	888.8	6,256.28
Do.	Sagay	Domestic Science	do	9.63× 11.00× 7.00	502.5	4,239.93
Do.	Escalante	Extension	do	11.20× 4.10× 8.20	1,095.1	9,503.45

TABLE VIII.—SCHOOLS—Continued

Province	Municipality	Buildings	Types and materials used	Principal dimensions	Total contents	Cost
				Meters	*Cu. meters*	
Occidental Negros	San Juan, San Carlos	1	Concrete wood with G. I. roof	14.00× 12.00× 7.75	1,104.6	₱5,995.00
Do.	Valladolid	Extension	Concrete with G. I. roof	14.00× 11.70× 7.25	1,036.8	9,931.95
Do.	do.	do.	do.	10.60× 11.70× 7.25	846.4	6,628.02
Do.	Ayungon, La Carlota	1	do.	12.00× 14.00× 7.75	1,104.6	6,162.59
Do.	La Castellana	Extension	Concrete wood with G. I. roof	7.00× 11.00× 7.75	490.5	3,189.62
Do.	San Juan, Pontevedra	1	do.	9.00× 27.00× 7.65	1,555.2	6,071.35
Do.	Suay, Himamaylan	1	do.	18.00× 9.00× 7.65	1,057.3	5,073.52
Do.	Isio, Cauayan	1	do.	12.00× 14.00× 8.75	1,104.6	5,298.30
Do.	Sipalay, Cauayan	1	do.	12.00× 14.00× 7.75	1,104.6	4,435.42
Oriental Misamis	Balingasay	Additional rooms	Concrete and wood with G. I. roof	11.70×18.60	1,478.4	10,345.46
Do.	Opol, Cagayan	1	do.	5.40× 14.00×12.00	1,108.8	7,800.36
Do.	do.	Additional rooms	Concrete wood with G. I. roof	2.40× 14.00×12.00	1,108.8	6,151.25
Oriental Negros	Dumaguete	Home Economic	Concrete and wood with G I. roof	12.50× 7.00× 4.00	700.4	3,250.00
Do.	Ayuquitan	Additional rooms	Concrete wood with G. I. roof	17.50× 11.00× 5.40	1,533.9	7,500.00
Do.	Manjuyod	do.	do.	7.00× 11.00× 5.40	1,119.3	5,601.91
Do.	Campalanas, Lazi	1	do.	14.00× 12.00× 5.40	1,313.8	5,980.00
Do.	Lazi	1	do.	28.00× 12.00× 5.40	2,613.6	11,740.00
Do.	Talingting	1	do.	21.00× 12.00× 5.40	1,968.1	8,900.00
Palawan	Igabas, Cuyo	1	Concrete and wood with G. I. roof	9.55× 18.55× 8.02	1,420.7	4,945.03
Do.	Rizal, Cuyo	1	do.	9.55× 15.55× 8.02	1,420.7	5,889.78
Pampanga	Macabebe	1	Concrete with G. I. roof	12.00× 28.00× 8.50	2,653.4	17,704.53
Pangasinan	Villasis	1	do.	11.80× 14.10× 8.65	1,196.3	6,223.21
Do.	Mangatarem	Shop	Concrete with G. I. roof (Special Plan, D. E.)	8.60× 18.10× 7.70	1,188.1	5,125.24
Do.	Santa Barbara	1	Concrete wood with G. I. roof	11.00× 18.18× 8.24	1,421.6	9,979.12
Do.	Urdaneta	Additional rooms	Concrete with G. I. roof	11.70× 42.20× 8.06	3,605.1	20,961.27
Do.	Dagupan	1	do.	11.70× 20.00× 8.46	1,277.7	7,267.38
Do.	Olo, Mangatarem	1	Concrete wood with G. I. roof	9.00× 18.00× 7.70	1,151.4	6,432.59
Do.	Camaley, Binmaley	1	do.	9.00× 18.00× 7.70	1,151.4	5,915.10
Do.	Real, Urbiztondo	1	do.	9.00× 18.00× 7.70	1,151.4	6,523.38
Do.	Turao, San Carlos	1	do.	9.00× 18.00× 7.70	1,151.4	5,848.71
Do.	Tandoc, San Carlos	1	do.	9.00× 18.00× 7.70	1,151.4	5,795.54
Do.	Estanza, Lingayen	1	Concrete with G. I. roof	12.20× 21.00× 8.06	1,945.7	11,819.79
Do.	Laoag, Manaoag	1	do.	12.25× 21.00× 8.06	1,945.7	11,843.51
Do.	Santa Maria	Additional rooms	do.	11.80× 14.10× 8.65	1,196.3	6,282.25
Do.	Malasiqui	1	Concrete wood with G. I. roof	11.00× 18.15× 8.24	1,420.8	10,694.48
Do.	Caoayan, Kiling, San Carlos.	1	do.	9.00× 18.00× 7.70	1,151.4	3,671.32
Rizal	Navotas	1	Concrete with G. I. roof	7.20× 12.20× 8.60 10.60× 11.20× 8.60	1,518.2	10,196.78
Do.	Tinajeros, Malabon	1	Concrete wood with G. I. roof	9.00× 32.00× 8.05	1,994.4	9,629.99
Do.	Pasay	1	do.	9.00× 32.00× 8.05	1,994.4	7,662.22
Romblon	España, San Fernando	1	Concrete and wood with G. I. roof	32.00× 9.00	1,905.6	9,118.75
Do.	Romblon	1	Concrete with G. I. roof (2 story)	31.50×20.60	4,478.5	33,000.00
Do.	Odiongan	1	do.	28.00×12.00	2,574.0	15,897.20
Samar	Borongan	Domestic Science	Concrete and wood with G. I. roof	12.50× 7.00× 5.57	437.9	4,999.19
Do.	Llorente	1	do.	18.00× 9.00× 7.00	1,080.0	4,999.35
Do.	Oras	1	do.	18.00× 9.00× 7.00	1,080.0	4,625.93
Do.	Tarangnan	Additional rooms	Concrete wood with G. I. roof	36.00× 10.50× 7.50	1,215.0	4,640.00
Sorsogon	Bacon	1	do.	46.00× 11.00× 8.40	2,767.8	9,662.12
Do.	Bulusan	1	Wood with G. I. roof	12.00× 7.00× 6.55	370.6	5,078.87
Surigao	Lianga	1	Concrete and wood with G. I. roof	14.00× 11.00× 5.40 21.00× 12.00× 5.40	2,509.9	14,497.65
Do.	Baurag	1	do.	21.00× 12.00× 5.40	1,656.9	10,745.66
Do.	Dinagat	1	do.	28.00× 12.00× 5.40	2,209.2	13,219.95
Tarlac	Concepcion	Domestic Science	do.	11.20× 17.20× 5.30	1,336.3	11,731.88
Do.	Tarlac	Trade School additional rooms.	Concrete with G. I. roof	18.90× 7.80× 5.15	925.1	7,932.02
Do.	Anao	1	do.	17.60× 11.70× 5.20	1,323.0	6,800.00
Do.	Tarlac	Trade	do.	24.90× 51.40× 7.65	6,387.6	33,500.00
Tayabas	Agdangan, Unisan	Additional rooms	do.	14.00× 12.00× 5.00	1,033.2	10,111.39
Do.	Catanauan	do.	do.	14.90× 12.00× 5.00	1,033.2	9,912.00
Do.	Polillo	do.	Concrete and wood with G. I. roof	9.00× 9.00× 5.00	469.8	2,809.20
Do.	Pagbilao	do.	do.	13.00× 16.50× 7.00	1,684.1	12,985.54
Do.	Macalelon	do.	Concrete wood with G. I. roof	7.00× 12.00× 5.00 10.50× 11.00× 5.00	1,241.9	7,635.21
Do.	Infanta	Domestic Science	do.	11.00× 18.15× 5.00	1,211.9	12,404.55
Do.	Atimonan	Additional rooms	Concrete with G. I. roof	7.00× 11.50× 5.00	933.8	7,999.53
Do.	Lucena	do.	do.	7.00× 11.50× 5.00 21.00× 11.50× 5.00	1,867.6	14,924.88
Do.	Pitogo	do.	do.	14.00× 12.00× 5.50	1,033.2	9,794.71
Do.	Padre Burgos	do.	do.	7.00× 9.00× 5.00	440.6	4,586.00
Do.	Mamala, Sariaya	do.	do.	14.00× 12.00× 5.00	1,033.2	9,873.24
Do.	Guinayangan	do.	do.	14.00× 11.50× 5.00	933.8	8.215.77
Do.	Casiguran	do.	Concrete wood with G. I. roof	7.00× 12.00× 5.00	520.8	2,314.79
Do.	Quezon	do.	Concrete with G. I. roof	7.00× 11.50× 5.00	466.9	3,757.48
Zambales	Masinloc	1	do.	14.05×28.00	2,457.1	13,323.69
Do.	Nagbayto, San Marcelino.	Rural High	do.	14.05×28.00	2,457.1	
Do.	Masinloc	1	do.	14.05×28.00	2,457.1	13,449.72
Do.	Santa Cruz	1	do.	14.05×28.00	2,457.1	

TABLE IX.—HOSPITALS

Province	Municipality	Buildings	Types and materials used	Principal dimensions	Total contents	Cost
				Meters	*Cu. meters*	
Ilocos Norte	Badoc	Emergency Hospital	Concrete wood with G. I. roof (Bukidnon type)	5.50×11.00× 5.00	407.0	₱31,999.52
Do.	Dingras	do.	Masonry concrete with G. I. roof (Bukidnon type)	19.00× 4.50× 4.90	461.4	6,867.37
Lanao	Wato	Dispensary	Concrete with G. I. roof	5.50× 9.50× 4.45	264.3	1,110.14
Do.	Dansalan	Leper Cottage for Male Ward.	do.	9.00× 5.00× 4.50	203.8	1,424.07
Do.	do.	Leper Cottage for Female Ward.	do.	9.00× 5.00× 4.50	203.8	
Leyte	Alangalang	Dispensary	do.	12.00× 8.00× 7.20	579.0	3,154.08
Manila	San Felipe Neri, Rizal	Male Chronic Ward	Concrete and tiles with G. I. roof (2 story)	50.30×40.00×11.84	17,076.6	220,104.00
Do.	San Lazaro Hospital	Human body Crematory.	do.	17.50× 8.50× 6.71	829.5	16,880.02
Masbate	Masbate	Dispensary	Concrete and wood with G. I. roof	6.00×19.00× 5.00	580.0	7,023.00
Nueva Ecija	Cabanatuan	Administrative	Concrete with G. I. roof	15.20×15.20×13.30	2,889.6	97,753.09
Do.	do.	Ward Pavilion	do.	9.90× 7.40× 7.20	1,164.6	
Do.	do.	Kitchen	do.	11.00×11.00× 7.70	882.7	
Oriental Misamis	Cagayan	El Salvador Dispensary.	Concrete and wood with G. I. roof	9.00× 6.00× 5.00	310.5	2,150.00
Do.	Balingasag	Dispensary	do.	8.00× 6.00× 5.00	276.0	3,447.27
Pampanga	San Fernando	Provincial Hospital	Concrete with G. I. roof	11.50×11.50× 9.25 37.54×14.24×14.15	8,734.3	105,744.86
Sorsogon	Sorsogon	do.	do.	26.00×11.00× 8.65	5,833.6	78,787.97



MUNICIPAL BUILDING, BAUAN, BATANGAS PROVINCE

TABLE X.—MARKETS AND TIENDAS

Province	Municipality	Buildings	Types and materials used	Principal dimensions	Total contents	Cost
				Meters	*Cu. meters*	
Albay	Legaspi	Market	Concrete with G. I. roof (Type "A")	24.00×42.00× 8.20	5,722.9	₱25,117.92
Do.	do	Tiendas	do	6.20×16.70× 4.75	524.6	9,422.00
Do.	do	do	do	6.20×16.70× 4.75	522.0	
Do.	do	do	do	10.20×20.70× 5.60	1,061.3	8,880.00
Do.	do	do	do	6.20×12.70× 4.75	359.4	3,780.00
Do.	Guinobatan	Market	do	24.00×42.80× 8.20	5,722.9	23,838.28
Do.	Tabaco	Tiendas	do	5.40×44.70× 4.75	1,161.6	14,050.11
Baguio	Baguio, City of	Slaughterhouse	Concrete with G. I. roof	7.32× 5.41× 3.00	148.8	728.27
Batangas	Lipa	Tiendas	do	2- 4.40×20.70× 5.29	472.7	11,495.33
Bohol	Calape	Block of Tiendas	do	36.00× 5.00× 5.31	834.3	8,350.45
Do.	Jagna	1	do	15.00×39.00× 7.08	3,239.5	13,442.84
Do.	Talibon	1	do	21.00×43.50× 8.44	5,182.8	21,446.47
Do.	Sierra Bullones	1	do	12.00×21.00× 6.80	1,258.7	7,080.97
Bulacan	Baliuag	Market	do	44.10×30.60× 8.83	12,205.2	23,508.73
Camarines Sur	Nabua	Tiendas	do	10.20×28.70× 6.42	1,519.4	15,192.08
Capiz	Panitan	1	do	12.00×30.00× 6.35	1,525.2	10,217.25
Do.	Mendez	1	do	18.00×31.00× 5.95	2,358.9	15,028.00
Do.	Dao	Market	do	18.00×34.00× 7.20	2,958.1	15,988.17
Do.	do	Matadero	do	8.90×12.20× 5.00	361.7	5,452.79
Cavite	Tanza	Market	do	22.50×12.00× 4.70	1,563.5	5,424.12
Cebu	Tejero, Cebu	1	do	18.00×34.00× 8.15	3,545.9	14,769.88
Cotabato	Dulawan, Cotabato	1	do	15.00×47.00× 3.50	2,467.5	7,276.12
Ilocos Norte	Dingras	Matadero	do	3.00× 8.90×12.20	416.2	4,969.61
Ilocos Sur	Candon	Tiendas	do	15.00× 8.00× 5.30	551.2	4,745.81
Iloilo	Iloilo	do	do	8.00×34.00× 5.70	2,903.6	18,375.41
Do.	Sara	do	do	8.30×16.80× 4.10	1,162.2	10,624.25
Laguna	Cavinti	Market	do	12.00×30.00× 6.25	1,862.4	9,026.73
Do.	Luisiana	Slaughterhouse	do	8.90×12.20× 6.00	544.7	5,660.06
La Union	Bangar	1	do	15.00×27.00× 7.35	2,283.8	10,180.64
Leyte	Alangalang	Market	do	15.00×27.00× 5.32	1,637.0	11,327.38
Nueva Ecija	Cabanatuan	Tiendas	do	5.00×22.50× 3.42	691.4	8,236.13
Do.	San Jose	1	do	15.00×27.00× 4.35	2,231.8	85,928.64
Occidental Misamis	Aloran	Market	do	12.00×21.00	996.7	7,350.00
OrientalNegros	Libertad	1	Concrete with G. I. roof (Solano Type)	22.50× 9.00× 4.00	1,310.9	4,800.00
Occidental Negros	Hinigaran	Market	Concrete wood with G. I. roof	4.00× 8.00× 2.20	140.8	7,938.11
Pampanga	Santa Rita	do	Concrete wood with G. I. roof	9.30×18.30	951.9	2,658.81
Pangasinan	Bayambang	1	Concrete with G. I. roof (Type "B")	21.00×43.50× 8.32	5,192.2	19,294.51
Do.	San Quintin	1	Concrete with G. I. roof (Type "A")	21.00×32.40× 8.60	4,144.6	12,703.21
Do.	Pozorrubio	1	Concrete with G. I. roof (Type "B")	21.00×39.80× 8.32	4,793.4	16,765.13
Do.	Mangatarem	1	do	21.00×39.80× 8.32	4,793.4	17,707.89
Do.	San Jacinto	Market	do	21.00×25.00× 8.32	2,092.5	10,406.11
Do.	Bayambang	Tiendas	Concrete wood with G. I. roof	9.40×22.50× 5.00	700.9	3,464.70
Do.	Alaminos	Slaughterhouse	do	8.40×10.40× 6.10	439.9	5,695.23
Do.	Tayug	Tiendas	Concrete with G. I. roof	8.00×39.70× 4.88	1,326.8	4,998.42
Do.	San Nicolas	Slaughterhouse	do	11.20×14.50× 5.85	796.8	2,197.12
Do.	Tayug	Market	Concrete with G. I. roof (Type "B")	21.00×39.80× 8.32	3,926.9	15,931.28
Rizal	Pasig	1	Concrete with G. I. roof	21.00×54.60× 8.50	7,726.9	40,883.32
Do.	do	Slaughterhouse and Hog Pen.	do	8.90×18.80× 6.05	861.7	
Do.	do	Tiendas	do	29.00× 6.00× 6.70	948.3	
Do.	Antipolo	Slaughterhouse and Hog Pen.	Concrete with G. I. roof (Type "B")	6.00×14.00× 6.05	508.2	2,478.06

TABLE X.—MARKETS AND TIENDAS—Continued

Province	Municipality	Buildings	Types and materials used	Principal dimensions	Total contents	Cost
				Meters	*Cu. metres*	
Rizal	Pateros	1	Concrete with G. I. roof (Type "B")	15.00×31.00× 7.30	2,720.3	₱7,593.54
Do.	San Felipe Neri	Market	....do	15.00×35.00× 6.25	2,725.5	14,489.19
Do.	....do.	Slaughterhouse	....do	8.90×15.50× 6.05	895.2	
Tayabas	Macalelon	Market	....do	8.00×16.00× 4.50	183.1	2,977.24
Zamboanga	Dipolog	....do	....do	50.90×21.00× 8.45	6,041.8	27,749.17
Do.	Isabela	....do	....do	12.00×21.00× 6.93	1,325.9	6,470.31

TABLE XI.—PRESIDENCIA

Albay	Polangui	1	Concrete with G. I. roof (Gumaca Type) (2 story)	8.60×18.30× 5.20 10.30×20.00× 6.30	1,776.0	19,593.46
Do.	Libog	1	Concrete and wood with G. I. roof (Muntinlupa type) (1 story).	7.20×14.20× 8.15	759.0	6,568.75
Benguet	Itogon	1	Concrete and stone with G. I. roof (1 story)	8.00×16.00	144.0	7,719.20
Do.	Trinidad	1	Concrete and flat iron roof (2 story)	8.00×16.00	288.0	4,453.16
Bulacan	Bigaa	1	Concrete wood with G. I. roof (Clarin Type) (1 story).	13.20× 8.20× 9.50	275.4	6,607.47
Cagayan	Solana	1	Concrete wood with G. I. roof (San Jose Type) (2 story).	17.10× 9.10× 8.05	1,456.3	19,225.82
Do.	Aparri	1	Concrete wood with G. I. roof (Calbayog Type) (2 story).	26.00×14.80×11.05	4,082.7	47,605.73
Camarines Sur	Caramoan	1	Concrete and wood with G. I. roof (Magalang type) (2 story).	10.30×2.00×12.20	2,098.6	23,399.96
Cavite	Indang	1	Concrete and wood with G. I. roof (Compostela Type) (2 story).	14.10×11.50× 7.40	1,160.9	18,984.68
Do.	Silang	1	....do	14.10×11.50× 7.40	1,160.9	19,079.59
Do.	Indang	1	Concrete wood with G. I. roof (Compostela Type) (2 story).	14.00× 8.00× 3.90	1,173.1	16,229.80
Ilocos Norte	Solsona	1	....do	14.00× 9.00× 3.90	1,088.6	18,642.94
Do.	Batac	1	Concrete with G. I. roof (Magalang Type) (2 story).	4.00×10.30×20.00	1,798.3	25,885.04
Iloilo	La Paz	1	....do	18.30× 8.60×10.90 4.45× 7.84× 6.00	1,431.3	29,102.16
Do.	Passi	1	Concrete wood with G. I. roof (Magalang Type) (2 story).	18.30× 8.60×10.90	1,640.6	16,340.31
Lanao	Kolambugan	1	Concrete with G. I. roof Antipolo Type) (2 story).	6.80×11.80× 7.30 1.60× 5.00× 3.80	777.6	9,653.01
Nueva Vizcaya	Bambang	1	Concrete wood with G. I. roof (Magalang Type) (2 story).	6.80×11.80× 3.80	388.6	6,910.07
Occidental Negros	Binalbagan	1	Concrete and wood with G. I. roof (Magalang Type) (2 story).	15.05×20.00×10.90	1,921.8	32,569.40
Pampanga	Masantol	1	Concrete wood with G. I. roof (Magalang Type) (1 story).	7.40× 4.80× 8.58	836.7	7,800.00
Tarlac	Concepcion	1	Concrete with G. I. roof (Davao Type) (2 story)	24.80×12.40×10.70	3,621.9	47,607.97

TABLE XII.—MISCELLANEOUS

Agusan	Butuan	Post Office	Concrete and wood with G. I. roof (Alteration and repair only).	18.25× 7.20	871.5	3,400.00
Albay	Legaspi	Leprosarium	Concrete wood with G. I. roof	7.65×15.15× 6.85	773.5	3,700.00
Baguio	City	Laborers' Quarter No. 1.	Concrete wood	30.50× 3.66× 2.44	272.4	700.00
Do.	....do	Laborers' Quarter No. 2.	....do	2.44×24.40× 3.05	181.6	500.00
Benguet	Trinidad	Teacher's Cottage	Concrete and wood with G. I. roof	8.00× 8.00	252.0	2,000.00
Do.	....do	....do	....do	8.00× 8.00	264.0	2,000.00
Bukidnon	Managok, Malaybalay	Granary	....do	1.70× 7.00×21.00 3.00× 7.00×21.00	566.0	5,000.00
Do.	....do	Doctor's Quarters	Concrete wood with G. I. roof	7.00× 9.00	352.7	5,031.10
Do.	....do	Nurses' Quarters	....do	7.00× 7.00 3.50× 2.00	352.7	4,976.10
Bulacan	Malolos	Comfort Station	Concrete with G. I. roof	6.20× 6.95× 5.35	228.1	3,590.00
Camarines Sur	Nabua	School Outhouse	Concrete and wood with G. I. roof	2.00× 3.00× 4.15	40.6	2,411.35
Do.	....do	School Gardenhouse	....do	6.30×10.30× 9.50	346.8	
Do.	Pili	School Outhouse	....do	2.00× 8.00× 3.65	92.1	1,547.99
Do.	....do.	5 Cottages for Student Farmers.	Concrete wood with G. I. roof	5.00× 7.00× 6.00	985.5	7,801.06
Capiz	New Washington	Shop	....do	12.15×18.15× 6.00	1,133.7	4,422.87
Cotabato	Cotabato	Magazines for explosives.	Concrete and brick with tile roof	3.66× 3.00× 3.12	34.2	2,006.81
Ilocos Norte	Laoag	Midden Shed.	Concrete with G. I. roof	5.00× 6.20× 3.40	164.3	2,442.56
Ilocos Sur	Vigan	Provincial Capitol	Concrete and tiles with G. I. roof	2–34.25×20.00× 9.12	7,574.4	112,970.90
Iloilo	Iloilo	Annex to Provincial Capitol.	Concrete, masonry and wood with G. I. roof (reconstruction only) (2 story).	9.30×30.90×13.60	3,132.3	24,875.60
Do.	Balasan	School Toilet	Concrete wood with G. I. roof	2.00× 3.00× 4.50	54.2	927.92
Do.	Tigbauan	....do	....do	2.00× 3.00× 4.50	54.2	1,459.95
Do.	Pavia	Septic Vault and Toilet for School.	....do	4.00× 5.00× 5.70	113.8	1,591.35
Do.	Passi	....do	Concrete and wood with G. I. roof	2– 2.00× 3.00× 4.50	54.2	1,240.20
Do.	Dueñas	....do	....do	2– 2.00× 3.00× 4.50	54.2	984.39
Do.	Alimodian	....do	....do	2– 2.00× 3.00× 4.50	54.2	1,049.45
Do.	Maasin	....do	....do	2– 2.00× 3.00× 4.50	54.2	1,326.13
Lanao	Momungan	Meat Shed	Concrete wood with G. I. roof	9.00×21.78× 2.75	287.5	714.85
Do.	Lambatan	Mess, Hall, Kitchen and Porch.	Concrete with G. I. roof	2– 8.00× 8.00× 3.70 3.00× 9.00	1,387.9	9,980.83
Do.	Maria Cristina	Rest House	Concrete and wood with G. I. roof	5.00× 7.00× 3.00	133.0	318.22
Leyte	Alangalang	Post Office	Concrete wood with G. I. roof	12.00× 8.00× 7.20	579.0	3,154.08
Manila	Padre Faura	U. P. Library	Concrete with G. I. roof (3 story)	41.00×33.96×17.93	28,580.4	215,567.00
Do.	San Felipe Neri, Rizal	Theraphy Cottages, Insular Asylum.	Concrete with G. I. roof (2 story)	2–10.00×10.00× 8.25	1,446.7	9,592.00
Do.	....do	Alienist Quarter, Insular Asylum.	Concrete wood with G. I. roof	12.00× 9.00×10.95	766.8	11,336.00
Do.	....do	Carbage Incinerator Insular Asylum.	Adobe stone, brick with concrete roof	4.92× 2.30× 2.41 1.00× 1.00× 1.50	28.8	3,815.00
Do	Pasay, Rizal	Servant's Quarter for Deaf and Blind School.	Concrete with G. I. roof (2 story)	7.20× 6.20×11.40	569.0	8,000.00
Mountain Province	Bontoc	Provincial Official Quarters.	Concrete wood with G. I. roof	7.30×12.10× 6.35	440.7	3,372.41
Nueva Ecija	Cabanatuan	Study Hall	....do	12.00×28.00× 5.40	1,545.6	16,384.27
Nueva Vizcaya	Solano	Presidencia Toilet	....do	4.50× 2.50	32.6	1,456.20
Occidental Negros	Himamaylan	Puericulture Center	....do	11.00× 8.00× 7.85	417.2	3,985.66
Samar	Catarman	3-Students Cottages	....do	5.00× 7.00× 5.50	588.0	869.91
Sulu	Lapak, Siasi	Kitchen and Mess Hall	....do	9.00×50.00	1,620.0	4,331.21
Do.	....do	Teacher's Cottage	....do	2– 8.50×15.50	614.0	3,171.45
Tayabas	Sariaya	Electric Power House	Concrete and G. I. with G. I. roof	6.00×15.00× 4.00	438.4	3,072.28

Trade School Building, Cebu Cebu Province

TABLE XIII.—THE FOLLOWING TABULATION SHOWS THE NUMBER OF DURABLE BUILDINGS CONSTRUCTED SINCE 1921 TO DECEMBER 31, 1930, THEIR CUBICAL CONTENTS AND COSTS

Year	Schools	Markets and tiendas	Hospitals	Other durable buildings	Total number of all durable buildings	Total contents	Reinforced concrete by content	Expenditures on buildings completed, buildings under construction and maintenance of buildings
						Cu. meters	*Per cent*	
1921	79	25	3	41	146	368,735	71	₱6,774,633.74
1922	49	15	1	46	111	314,014	88	4,287,121.76
1923	50	8	3	27	88	212,485	70	2,275,758.26
1924	76	15	12	21	124	308,177	89	2,911,816.19
1925	69	25	5	32	131	387,869	71	3,585,976.91
1926	55	14	10	28	107	255,618	62	5,025,024.96
1927	169	30	9	43	251	710,109	63	5,428,597.98
1928	134	41	22	18	235	490,868	68	6,838,439.99
1929	207	46	15	61	329	687,674	55	5,661,840.99
1930	258	56	16	61	391	396,126	58	5,910,513.66

AIDS TO NAVIGATION

The construction and repair of lighthouses and beacons continued to be under the supervision of the Bureau of Public Works pursuant to regulations adopted by the Department of Commerce and Communications.

There were nine new structures erected and fifteen lighthouses rebuilt and repaired at a total cost of ₱158,554.36. The largest and most important lighthouse constructed during 1930 was the Langoy Light Station. This station is composed of one sixth-order cylindrical tower and apparatus, one keeper's dwelling for two keepers and one boatman, one oil house, to concrete cisterns and about 2 kilometers of road and cost of ₱37,700. The maintenance of lamp mechanisms and buoys remained under the Bureau of Commerce and Industry, the total expenditure for that purpose amounting to ₱68,000. That Bureau also handled minor repair work on lighthouses costing less than ₱5,000.

ARTESIAN WELLS

There were 14 drilling machines in operation at the beginning of the year 1930. Due, however, to the limited Insular appropriation for this purpose, the operation of these machines, beginning with September first, gradually was decreased until the end of November when the operation of all machines from insular appropriations was discontinued.

During the year 1930, 102 public artesian wells were completed, 91 of which were successful and 11 unsuccessful. The Bureau also drilled 2 private wells, one for the United States Navy, Cavite Navy Yard, Cavite, and one for the City of Manila, the total cost of which was paid by the parties concerned. At the end of the year there were pending requests from 31 municipalities for the drilling of 183 artesian wells. From the year 1904 up to December 31, 1930, 2,210 artesian wells were drilled by the Bureau of Public Works at a total cost of ₱5,210,815.50. These figures include private wells drilled from 1904 to 1923. The successful wells are capable of supplying 54,771,700 gallons of water per 12-hour day which, at the rate of 20 gallons per capita, would supply a population of approximately 3,000,000 people.

FUNDS EXPENDED

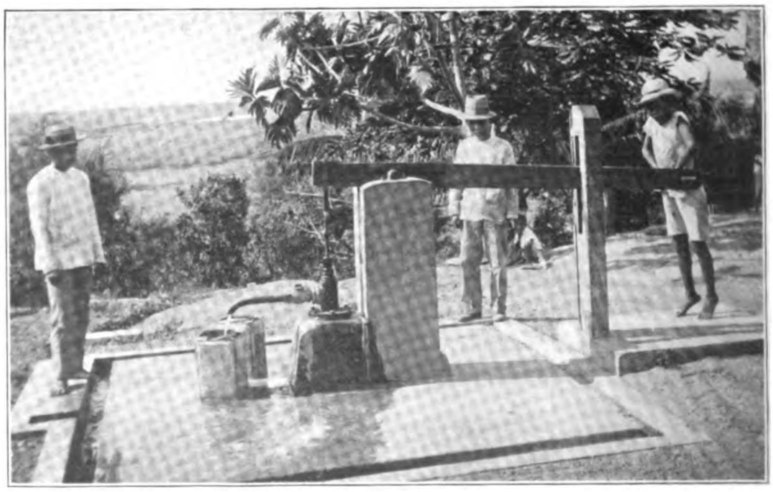
	1929		1930	
	Pesos	Per cent	Pesos	Per cent
Successful wells	188,115.78	87	165,900.57	90
Unsuccessful wells	27,328.06	13	17,934.39	10
Totals	215,443.84	100	183,834.96	100

Out of the amount of ₱150,000 insular funds appropriated for the drilling of artesian wells during 1930, only ₱1,000 was allotted to the Bureau of Science for the purpose of making geological surveys and investigations to determine the feasibility of drilling successful artesian wells in localities where a large percentage of unsuccessful wells have been drilled or where no attempt has previously been made to drill wells.

The strongest flowing well drilled during the year was in Urdaneta, Pangasinan, which has a yield of 300 gallons per minute, and was drilled to a depth of 366 feet.

DRILLING MACHINES OPERATED BY BUREAU OF PUBLIC WORKS

Month	Number of rigs in the field	Rigs engaged in drilling public wells	Rigs engaged on private job	Remark
January	15	10	5	One machine repairing a well in Binañgonan, Rizal; One machine cleaning a well in San Fernando, Pampanga; One machine drilling wells for the Insular Lumber Co., Fabrica, Occidental Negros; One machine awaiting order in San Felipe Neri, Rizal; and another one drilling a well for the City of Manila.
February	14	12	2	One machine awaiting order in Binañgonan, Rizal; One machine awaiting order in San Felipe Neri, Rizal.
March	13	12	2	One machine awaiting order in Binañgonan, Rizal.
April	14	13	1	One machine drilling a well for San Miguel Waterworks, Bulacan.
May	14	13	1	Do.
June	14	12	2	One machine cleaning well in Bulacan and another one drilling well for San Miguel Waterworks, Bulacan.
July	15	13	2	One machine making pump test in Gapan, Nueva Ecija, and another one drilling well for Cavite Navy Yard.
August	15	14	1	One machine drilling well for the Cavite Navy Yard, Cavite.
September	14	12	2	One machine drilling well at Cavite Navy Yard and another one cleaning well in Pasay, Rizal.
October	7	5	2	One machine drilling well for the Cavite Navy Yard and one cleaning well in Pasay, Rizal.
November	7	5	2	Do.
December	1	......	1	One machine drilling a well for Cavite Navy Yard.



Public Artesian Well, Alcala, Cagayan Province

COMPARATIVE COST OF DRILLING

	1929	1930	+ Increase — Decrease
A. Unsuccessful wells included:			
Per meter	₱23.40	₱22.52	₱— .88
Per foot	7.13	6.87	— .26
B. Not including unsuccessful wells:			
Per meter	22.61	24.58	+1.97
Per foot	6.89	7.49	+ .60

SUMMARY OF DEEP WELL DRILLING

Kinds of wells	Number of wells drilled		Total depth in feet		Total flow in gallons per minute	
	1929	1930	1929	1930	1929	1930
Successful:						
Flowing	17	19	6,685	7,594	823	1,003
Pumping	65	72	20,664	14,567	3,018	2,607
Totals	82	91	27,299	22,841	3,841	3,610
Unsuccessful	9	11	2,908	4,616	....	....
Grand totals	91	102	30,207	26,777	3,841	3,610

BUREAU OF PUBLIC WORKS MACHINE SHOP

The following table shows the activities of the Bureau of Public Works Machine Shop during the years 1929 and 1930.

Year	Number of personnel	Work orders completed	Cost of materials	Cost of labor	Total value of work performed
1929	79	955	₱41,541.24	₱52,827.59	₱94,368.83
1930	100	1,015	64,636.10	68,525.65	133,161.75

The Bureau of Public Works Machine Shop is also in charge of the maintenance and repair of the artesian wells belonging to the City of Manila, for which work the City of Manila appropriated the sum of ₱2,000 for 1930.

SUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 to DECEMBER 31, 1930

Well No.	Location	Depth	Diameter of casing	Capacity in gallons per minute	Date completed	Total cost
		Feet	*Inches*			
D-2542	Poblacion, Jetafe No. 15, Bohol.	51	8	P-20	2-20-30	₱1,735.18
D-2615	Barrio Makinabang, Baliwag No. 20, Bulacan.	202	4½	P-20	2-20-30	3,679.04
D-2618	Barrio Sambog, Cebu No. 68, Cebu.	135	6	P-15	1-30-30	1,435.63
D-2619	Barrio Labañgan, Cebu No. 69, Cebu.	173	4½	P-100	2-25-30	1,242.73
D-2620	Barrio Fuente, Cebu No. 70, Cebu.	103	4½	P-15	3-17-20	950.32
D-2621	Barrio Mabolo, Cebu No. 71, Cebu.	107	4½	P-15	3-31-30	981.39
D-2624	Barrio Borol Segundo, Bigaa No. 8, Bulacan.	428	4½	F-65	1- 9-30	1,885.54
D-2628	Barrio San Pablo, Aliaga No. 15, Nueva Ecija.	625	10, 8, 6, 4½	F-15	3- 6-30	4,835.48
D-2629	Barrio San Isidro, Lupao No. 2, Nueva Ecija.	91	10, 8	P-25	1- 9-30	1,835.76
D-2631	Poblacion, Burgos No. 2, Pangasinan.	180	8	P-10	1-19-30	1,247.07
D-2633	Barrio San Vicente, Urdaneta No. 23, Pangasinan.	267	4½	F-35	1-11-30	1,075.05
D-2635	Central Luzon Agricultural School, Muñoz No. 6, Nueva Ecija.	160	6	P-30	2- 5-30	1,822.48
D-2636	Barrio San Vicente, Binalonan, No. 23, Pangasinan.	335	4½	P-25	2-17-30	2,214.14
D-2637	Poblacion, Burgos No. 3, Pangasinan.	200	8	P-8	1-21-30	985.66
D-2638	Barrio Pulong Gubat, Bigaa No. 9, Bulacan.	419	6	F-60	4-10-30	3,506.09
D-2639	Poblacion, Burgos, No. 4, Pangasinan.	205	6	P-10	2- 5-30	867.36
D-2640	Barrio Parada, Santa Maria No. 5, Bulacan.	685	4½	P-25	7- 8-30	4,586.09
D-2641	Poblacion, Burgos No. 5, Pangasinan.	205	4½	P-10	2-10-30	920.84
D-2642	Provincial Nursery, Cabanatuan No. 31, Nueva Ecija.	708	4½	F-15	5- 7-30	5,120.68
D-2643	Barrio Laoac East, Manaoag No. 14, Pangasinan.	175	4½	F-35	3- 4-30	986.07

Legend:
D—Well Drilled by Deep Well Rig.
F—Flowing Well.
P—Pumping Well.

SUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 to DECEMBER 31, 1930—Continued

Well No.	Location	Depth	Diameter of casing	Capacity in gallons per minute	Date completed	Total cost
		Feet	*Inches*			
D-2644	Barrio Consuelo, San Francisco No. 5, Cebu.	33	4½	P-15	4- 7-30	₱1,520.42
D-2645	Poblacion, Mabini No. 1, Pangasinan.	325	6	P-10	3-17-30	2,112.25
D-2646	Barrio Santo Cristo, Pulilan No. 8, Bulacan.	600	4½	P-50	5- 4-30	5,524.10
D-2647	Barrio Cruz, Jetafe No. No. 15, Bohol.	65	4½	P-10	3-15-30	942.57
D-2648	Barrio Maca-as No. 1, Tubigon No. 5, Bohol.	62	4½	P-20	4- 9-30	1,234.06
D-2649	Barrio Maca-as No. 2, Tubigon No. 6, Bohol.	57	4½	P-20	4-28-30	954.79
D-2650	Barrio Pinayagan Norte, Tubigon No. 7, Bohol.	70	8	P-30	5-19-30	849.22
D-2651	Barrio Panadtaran, Tubigon No. 8, Bohol.	75	10, 8	P-20	6- 7-30	1,059.62
D-2653	Barrio Boliñgit, San Carlos No. 19, Pangasinan.	369	6	P-25	4- 3-30	2,555.09
D-2654	Barrio Laoac East, Manaog No. 15, Pangasinan.	181	4½	P-150	3-15-30	899.12
D-2655	Barrio Monic, Aliaga No. 16, Nueva Ecija.	528	6	F-7	4-10-30	3,198.79
D-2656	Barrio Pilapila, Binañgonan No. 22, Rizal.	216	4½	P-150	4-12-30	1,795.04
D-2657	Barrio Consuelo No. 2, San Francisco No. 6, Cebu.	31	4½	P-14	3-19-30	727.00
D-2658	Barrio Laoac Central, Manaoag No. 16, Pangasinan.	155	4½	F-5	4- 2-30	997.19
D-2659	Poblacion, Mabini No. 2, Pangasinan.	200	4½	P-6	3-31-30	1,245.52
D-2660	Barrio Sañgay, Cebu No. 72.	147	4½	P-15	4-12-30	1,008.50
D-2661	Barrio Bacayan, Cebu No. 73, Cebu.	140	4½	P-15	4-30-30	1,194.58
D-2663	Barrio Pagsubuñgan, Mandaue No. 14, Cebu.	124	4½	P-15	6-19-30	1,093.53
D-2664	Barrio Tawason, Mandaue No. 15, Cebu.	170	4½	P-15	7-10-30	1,504.93
D-2665	Barrio Union, San Francisco No. 7, Cebu.	61	4½	P-14	4-17-30	1,372.20
D-2666	Poblacion, Gattaran No. 1, Cagayan.	200	4½	P-35	5-22-30	2,136.53
D-2667	Market Site, Alaminos No. 3, Pangasinan.	240	6	P-10	4-16-30	1,676.29
D-2668	Libertad Street, Manaoag No. 17, Pangasinan.	30	6	P-30	4-23-30	1,157.61
D-2669	Barrio Taba-ao, Sagay No. 11, Occidental Negros.	738	6	P-10	6-30-30	5,385.71
D-2670	Barrio Dayong, San Carlos No. 20, Pangasinan.	139	8	P-150	4-23-30	1,776.27
D-2671	Barrio Darañgan, Binañgonan No. 23, Rizal.	400	6, 4½	P-140	7-14-30	4,998.26
D-2672	Poblacion, Aliaga No. 17, Nueva Ecija.	557	4½	F-15	6-30-30	4,539.19
D-2673	Barrio Tarese, San Carlos No. 21, Pangasinan.	151	6	P-150	5- 7-30	1,192.29
D-2674	Barrio Rosario, Pozorrubio No. 11, Pangasinan.	237	4½	P-30	5-13-30	1,540.37
D-2677	Barrio Ano, San Carlos No. 22, Pangasinan.	140	6	P-150	5-24-30	1,506.95
D-2678	Barrio Santo Cristo, Gapan No. 19, Nueva Ecija.	486	6	F-6	7-17-30	2,613.38
D-2679	Barrio Palac-palac, Pozorrubio No. 12, Pangasinan.	158	4½	P-30	5-31-30	1,369.95
D-2682	Poblacion, Gattaran No. 2, Cagayan.	215	4½	P-25	6-16-30	1,355.86
D-2683	Barrio Santa Maria, Binalonan No. 24, Pangasinan.	157	4½	P-150	7- 1-30	1,451.85
D-2684	Poblacion, San Francisco No. 9, Cebu.	109	4½	P-8	7-10-30	2,027.51
D-2685	Barrio Matabao, Tubigon No. 9, Bohol.	166	8	P-7	7-15-30	1,890.93
D-2686	Barrio Panaytayon, Tubigon No. 10, Bohol.	353	6	P-7	9-15-30	1,693.03
D-2690	Poblacion, Alcala No. 1, Cagayan.	250	4½	P-40	7-31-30	1,921.72
D-2691	Barrio San Vicente, Alaminos No. 6, Pangasinan.	150	6	P-10	7-16-30	1,479.49
D-2692	Barrio Ambonao, Calasiao No. 26, Pangasinan.	327	6	F-18	7-22-30	1,387.80
D-2693	Poblacicn, Urdaneta No. 24, Pangasinan.	366	4½	F-300	8-16-30	2,365.20
D-2694	Barrio Labugon, Mandaue No. 17, Cebu.	65	4½	P-15	7-24-30	778.23
D-2695	Barrio Cabangcalan, Mandaue No. 18, Cebu.	95	4½	P-15	8-16-30	384.29
D-2696	Southern Islands Hospital, Cebu No. 75, Cebu.	145	10	P-15	9- 2-30	929.00

Standard Market Building, Legaspi, Albay

SUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 to DECEMBER 31, 1930—Continued

Well No.	Location	Depth	Diameter of casing	Capacity in gallons per minute	Date completed	Total cost
		Feet	*Inches*			
D-2697	Tugas, Pardo, Cebu No. 76, Cebu.	101	4½	P-50	9-24-30	₱651.70
D-2698	Barrio Babag, Opon No. 9, Cebu.	30	6	P-15	10-14-30	515.68
D-2699	Barrio Sulukan, Angat No. 2, Bulacan.	86	8	F-10	7-31-30	1,708.98
D-2700	Barrio San Jose, Paombong No. 7, Bulacan.	390	6, 4½	F-100	8-10-30	2,805.26
D-2701	Barrio San Gabriel, Santa Maria No. 6, Bulacan.	650	4½	P-25	9-19-30	2,693.13
D-2702	Aquiñon Street, Isabela No. 6, Occidental Negros.	235	8	P-100	7-25-30	2,154.77
D-2703	Barrio Santo Tomas, Aliaga No. 18, Nueva Ecija.	627	4½	P-20	10-16-30	4,184.20
D-2704	Gotamco Street, Pasay No. 17, Rizal.	650	4½	P-140	9-16-30	4,060.09
D-2705	Barrio Santa Cruz, San Francisco No. 10, Cebu.	40	4½	P-15	8-13-30	1,338.79
D-2706	Purificacion Street, Alaminos No. 7, Pangasinan.	295	4½	P-4	8- 9-30	1,410.23
D-2709	Poblacion, Alcala No. 2, Cagayan.	281	4½	P-35	8-18-30	1,581.99
D-2710	Barrio Benlag, Calasiao No. 27, Pangasinan.	600	4½	F-7½	9-24-30	2,569.06
D-2711	Angat No. 3, Bulacan	445	4½	F-40	9-29-30	2,074.15
D-2712	Barrio Santo Niño, Paombong No. 9, Bulacan.	335	4½	F-100	9-13-30	1,879.64
D-2713	Barrio Bacal, Talavera No. 11, Nueva Ecija.	300	6	P-30	9-17-30	1,871.17
D-2714	Barrio Caridad, Umiñgan No. 5, Pangasinan.	186	4½	P-10	9-11-30	1,334.93
D-2715	Barrio Alos, Alaminos No. 9, Pangasinan.	180	6	P-10	9- 6-30	1,878.47
D-2716	Barrio Bacock, San Francisco No. 11, Cebu.	46	4½	P-14	9- 2-30	1,221.00
D-2718	Barrio Pinagtuluyan, Paombong No. 10, Bulacan.	392	4½	F-160	10-15-30	1,059.21
D-2719	Poblacion, Umiñgan No. 6, Pangasinan.	315	4½	P-20	10- 9-30	992.91

For Legend see page 37.

SUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 to DECEMBER 31, 1930—Continued

Well No.	Location	Depth	Diameter of casing	Capacity in gallons per minute	Date completed	Total cost
		Feet	*Inches*			
D-2720	Kenyon Street, Isabela No. 7, Occidental Negros.	238	8	P-90	11-27-30	₱1,400.73
D-2721	Barrio Belolo, Zaragoza 5, Nueva Ecija.	305	4½	F-20	11-19-30	1,692.29
D-2722	Namapian, Umiñgan No. 7, Pangasinan.	104	8, 6	P-20	11- 5-30	1,214.31
D-2723	Barrio Posok, Opon No. 10, Cebu.	35	6	P-15	10-30-30	457.19
D-2724	Barrio Marigondon, Opon No. 11, Cebu.	36	6	P-15	11-11-30	391.56
D-2725	Barrio Basak, Opon No. 12, Cebu.	38	4½	P-15	12- 2-30	400.05
D-2729	Barrio Esperanza, Umiñgan No. 8, Pangasinan.	234	6, 4½	P-15	11-26-30	900.29
	Total	22,161		3,610		165,900.57

For Legend see page 37.

UNSUCCESSFUL ARTESIAN WELLS DRILLED BY THE BUREAU OF PUBLIC WORKS FROM JANUARY 1 to DECEMBER 31, 1930

Well No.	Location	Date completed	Depth	Diameter of casing	Total cost	Remarks
			Feet	*Inches*		
2541	Poblacion, Ubay No. 6, Bohol .	1-20-30	425	8	₱1,825.53	Salty water.
2616	Barrio Talluñgan, Aparri No. 5, Cagayan.	2-20-30	30	([a])	2,614.18	No water.
2623	Poblacion, Burgos No. 1 1, Pangasinan.	1- 8-30	681	8, 6	1,302.98	Salty water.
2632	Barrio Basista, San Carlos No. 18, Pangasinan.	3- 1-30	278	6	1,938.75	Do.
2634	Barrio Santiago No. 2, San Francisco No. 4, Cebu.	1-18-30	58	6	1,427.31	Do.
2652	Poblacion, Lal-loc No. 1, Cagayan.	3-28-30	680	8, 6	1,446.70	No water.
2662	Barrio Pit-os, Cebu No. 74, Cebu.	5-31-30	135	6, 4½	1,213.22	Do.
2675	Poblacion, Alaminos No. 4, Pangasinan.	5-34-30	590	4½	1,523.46	Do.
2676	Barrio Esperanza, San Francisco No. 8, Cebu.	5-29-30	35	4½	1,614.06	Salty water.
2680	Poblacion, Alaminos No. 5. Pangasinan.	6-19-30	710	6, 4½	1,448.44	No water.
2681	Barrio San Juan, San Carlos No. 23, Pangasinan.	6-22-30	222	6	1,579.76	Salty water.
	Total		4,124		17,934.39	

[a] Not Known.

WELLS UNDER CONSTRUCTION AS OF DECEMBER 31, 1930

Well No.	Location	Date commenced	Depth	Diameter of casing	Capacity in gallon per minute	Partial cost
			Feet	*Inches*		
2728	Barrio Langka, Meycauayan No. 6, Bulacan.	10-16-30	120	6	P-28	₱1,829.97
	Total		120		28	1,829.97

SUMMARY OF WORK ACCOMPLISHED BY EACH WELL BORING RIG IN OPERATION DURING 1930

Rig No.	Wells completed			Capacity in gallons per minute		Depth in feet		Amount expended				Repair jobs undertaken		Period of operation
	Successful							Successful			Unsuccessful			
	Flowing	Pumping	Unsuccessful	Flowing	Pumping	Successful	Unsuccessful	Flowing	Pumping	Total		Job No.	Days employed	
3	4	10		375	480	2,960		₱5,423.51	₱13,075.48	₱18,498.99				1- 1-30 to 11-25-30
(4)		(1)			(150)	(600)			(7,853.10)	(7,853.10)				7-26-30 to 12-15-30
6		6	2		80	319	275		8,406.92	8,406.92	₱3,041.37			1-19-30 to 9- 2-30
10		4	2		135	946	1,020		6,996.10	6,996.10	4,060.88			1- 1-30 to 8-18-30
11		3			450	1,265			10,853.39	10,853.39		2	80	1- 1-30 to 11-20-30
12		10	3		88	2,180	2,261		13,823.18	12,823.18	4,274.88			1- 1-30 to 9- 6-30
15	2	2		125	50	2,182		5,391.63	7,279.22	12,670.85		1	23	1- 1-30 to 9-19-30
17	4	1		57	20	2,642		14,265.75	4,184.20	18,449.95				1- 1-30 to 11-19-30
18	3	2		350	70	1,919		5,744.11	9,203.14	14,947.25		1	26	1- 1-30 to 11-29-30
19	2	3		21	85	1,745		7,734.06	5,529.42	13,263.48		1	17	1- 1-30 to 9-17-30
21		3			200	1,211			8,941.21	8,841.21				3- 9-30 to 11-17-30
23	2	4	2	25	475	1,726	500	3,956.86	7,030.60	10,987.46	3,518.51			1- 1-30 to 9-24-30
24		8	1		134	899	425		10,359.40	10,359.40	1,825.53			1- 1-30 to 9-15-30
(26)		(1)			(30)	(322)			(3,758.45)	(3,758.45)				10-30-29 to 1-28-30
27		16	1		360	1,636	135		13,919.26	13,919.26	1,213.22			1- 1-30 to 12- 2-30
28	2			50		531		3,783.13		3,783.13		1	90	4- 1-30 to 9-29-30
Total	19	72	11	1,003	2,607	22,161	4,616	46,299.05	119,601.52	165,900.57	17,934.39	6	236	

DESIGNING DIVISION

J. C. COOKINHAM, *Chief Designing Engineer*

The preparation of plans for bridges and portworks and the electrical and mechanical features of public projects constituted the major work of the Designing Division during the year. Revision of standard bridge and culvert plans was undertaken, increasing the clear roadway from 16 to 18 feet. Plans for the proposed new Ayala and Mendiola Bridges across the Pasig at Manila were near completion at the end of the year. Both of these structures will be through riveted trusses for four-way traffic.

Good progress was made on the Revolving Fund bridge construction program (Arranz Act), and a large amount of investigation and planning was done for additional structures.

The calyx-drills now in use for sub-soil investigations at the sites of proposed bridges, etc., are now old and badly worn. Considerable difficulty has arisen at times due to faulty data and it is certain that new machines and assignment of technical supervision is necessary to insure satisfactory results. The calyx-drill organization now available and the system of finance under which it is operated are not adequate to meet the demands made upon it.

While good progress was made on portworks in general, it was not possible to undertake detailed study of future projects for new construction or improvement to any great extent, as the limited personnel was engaged in preparing plans for work for which funds were already provided.

An increasing amount of work is handled annually by the electrical and mechanical engineers, covering a wide variety of technical subjects pertaining to all branches of the Government. A considerable part of their work consisted in studies, reports and advice on matters submitted by other bureaus and offices, which, in addition to the preparation of plans and specifications for routine projects, taxed the force available to the utmost.

The cement-gun outfits owned by the Bureau were kept busy throughout the year on concrete repair work at Manila and in the provinces.

The usual systematic testing of cement and concrete aggregate used in Government work was carried on, as well as the testing of the resulting concrete. No failure of "Apo" cement occured, nor was it necessary to resort to the use of any other cement for lack of supply. Concrete tests were uniformly good, although some failures to meet the full specified strength were found and liquidated damages were collected accordingly. The following tabulation shows the number of tests of concrete materials made by the Bureau of Science during the year for the information of this Bureau:

Total tests on cement from Bureau of Public Works and Bureau of Supply (1/10 barrels tested)	21,693
Total tests on concrete	10,335
Total tests on sand	54
Total tests on gravel	42

A total of 1,886 foreshore lease and land sales applications were investigated and reported on for the Bureau of Lands during the year, which is an increase of 12.7 per cent as compared with the total for 1929.

The activities of this Division in respect of preparation of plans, specifications and estimates for bridges, portworks, wiring of public works for electric power and lighting, pumping and power plants and other structures, as well as miscellaneous operations in the field, covering investigations, surveys, operation of cement-gun, sandblast and calyx-drill outfits, installations and construction projects are listed in Tables A, B, C, D, E, F, G, H, I, and J.

PORT WORKS CONSTRUCTION AND MAINTENANCE

PROVINCES

Butuan, Agusan.—An extension of the wharf at Butuan was undertaken with funds provided under Act 3670. This work consists of a 3 by 22.2 meter apron to accommodate small vessels.

Legaspi, Albay.—The contract for the construction of the East Breakwater was awarded to Messrs. Pedro Siochi & Co., Inc., in the sum of approximately ₱212,000 and construction was started on September 4, 1930. The work accomplished consisted of the completion of the southern extension of the breakwater, approximately 16 meters long, and 50 linear meters of the breakwater proper. The total amount of work done is estimated to be about 15 per cent of the entire project.

Mansion House, Baguio

Contract for the construction of the diversion canal for the Tibu River, commonly known as the Macabalo Diversion Canal, was awarded to Mr. Andres Bolinas, Jr. in the amount of approximately ₱13,000. Construction was started on August 5, 1930 and about 90 per cent of the entire project was completed. Additional funds will be needed for the construction of a small diversion dam at the head of the canal, and some protective work along the canal within the barrio of Dapdap.

Surveys of the proposed Basin and port area are now being made to obtain the data necessary to estimate the quantity of dredging and filling to be done. Periodic observations are also being made to investigate any shoaling or deepening of the proposed harbor due to current or wave action as affected by the portions of the improvement which are already in place.

Tabaco, Albay.—Investigation and surveys of this proposed port have already been made, and plans for the construction of a rock causeway and wooden landing are in preparation. This project will be advertised early in the coming year.

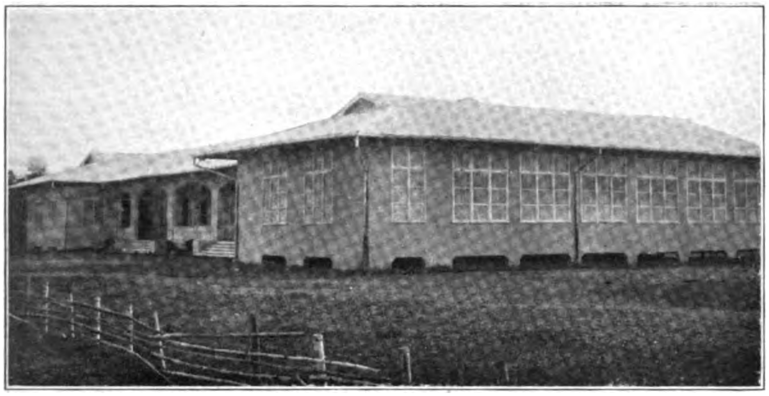
Batangas, Batangas.—The sum of ₱10,000 was available for the maintenance and improvement of the port of Batangas. Of this amount, about ₱2,000 was spent for purely maintenance work and the balance, together with the new appropriation for 1931, will be used in the construction of a reinforced concrete pier as an extension of the existing causeway.

Loay, Bohol.—Work was started in January, 1930, by administration. The improvements accomplished were the reconstruction of beacon No. 3, repair of the west jetty and the completion of approximately 25 per cent of the entire dredging to be done at the entrance channel to the proposed turning basin. It is estimated that approximately 60,000 cubic meters must be removed to obtain a depth of 4.5 meters below low water.

Basco, Batanes.—The work proposed at this place consists in the construction of 126 lineal meters of breakwater for the protection of small boats. The base of the first forty meters of this project has been laid.

Port of Uyugan, Batanes.—Proposed improvement consists in the excavation of a canal 10 meters wide by 103 meters long to a depth of 60 centimeters below mean lower low water, for the accommodation of bancas. A 5-meter width of the entire length of canal was completed.

Aparri, Cagayan.—The work under way at this place is for the purpose of directing and controlling the river current in such a manner as to stabilize the river bed and maintain a fixed channel across the bar. With this end in view, it is proposed to construct



Standard Elementary School Building, Balayan, Batangas

some 6,000 linear meters of timber hurdles. One thousand three hundred forty (1,340) linear meters of hurdles were constructed this year. It is proposed to build 630 linear meters of seawall during the ensuing year for which contract was left to the Arcon Construction Company.

Capiz, Capiz.—The end of 1930 witnessed the completion of the two breakwaters for this port; viz: the North Breakwater, 280 meters and the South Breakwater, 1,050 meters in length, respectively. These breakwaters will give adequate protection for the class of vessels visiting Capiz and, with the construction of a wharf and the necessary dredging, will provide an excellent harbor for northern Panay.

Cebu, Cebu.—The work completed at this port during the year consists of Pier No. 1, of reinforced concrete, 33.5 meters wide by 155 meters long, together with a reinforced concrete marginal wharf, 10 meters wide by 203 meters long. An additional pier, similar to the one completed, will be finished early in 1931. This work is being done under contract, by the Atlantic, Gulf & Pacific Company of Manila. Considerable preliminary investigation, design and preparation of plans, surveys and subsoil investigation was done preparatory to dredging the harbor and construction of further improvements.

Toledo, Cebu.—A landing for launches was constructed at Toledo, Cebu, consisting of a rock-fill causeway 90 meters long by five meters wide, with a steel sheet-pile head 12.7 by 34 meters. The work was done by Mr. C. Russell, contractor. Total cost ₱35,000.

Glan, Cotabato.—Plans were prepared for the improvement of this port, requiring a rip-rap causeway 200 meters in length and a 3 by 6 meter landing stage, the latter to be suplemented by 50 linear meters of timber wharf as more funds become available.

Davao, Davao.—Steel sheet piles were purchased for widening the present pier approach of Davao Pier No. 1.

Mati, Davao.—Mati Wharf consists of a T-shaped wooden structure extending about 149 meters outward from the shore. The stem of the "T" which forms the approach is about 1.20 meters wide and the wharf proper is 6 by 11 meters. The approach is gradually being replaced with a rock causeway about 4 meters wide, and a portion of it was widened to 6 meters. About 130 linear meters of rock approach is now completed.

Currimao, Ilocos Norte.—Currimao landing, consisting of 36 linear meters of marginal wall, with back fill, was practically complete at the close of the year.

Iloilo, Iloilo.—During the year, 490 linear meters of reinforced concrete marginal wharf were constructed for the accommodation of vessels of 18 to 30 foot draft, giving a total of 700 linear meters of new wharf. It is expected that an additional length of 340 meters will be completed very shortly. This work was very satisfactorily done under contract by Tan. C. Tee & Company. Two hundred ninety thousand (290,000) cubic meters of material were dredged from the Iloilo River and placed on the reclamation area for the proposed Iloilo Air Port. A rip-rap wall was constructed to retain this fill. The fill and wall are 85 per cent and 80 per cent completed, respectively. Work on the Spur Dykes and river jetties was continued under contract with the Visayan Stevedoring Company until the expiration of the contract in October, 1930.

Iligan, Lanao.—An addition of 34 linear meters of reinforced concrete pier, 12 meters wide, was completed during 1930 making available a total of 51 linear meters and leaving only 9 meters more of pier to be completed. This work is being done by administration.

Maasin, Leyte.—Plans are in preparation for 40 linear meters of rock-fill causeway and a timber landing 6 meters in width and 17 meters in length.

Leyte, Leyte.—The work on Leyte Causeway, which was commenced in 1926 and carried on intermittently, due to lack of funds, is at present 70 per cent complete, of which about 40 per cent was accomplished during 1930.

Tacloban, Leyte.—Under Act No. 3670, ₱30,000 was made available for the extension of the Tacloban Wharf. However, as this sum was not sufficient to induce contractors to offer bids for such heavy work, it was deemed advisable to withhold action until an adequate sum was available. During 1931, it is proposed to extend the work along the line of the present wharf with the use of steel sheet piles and back-fill.

Liloan, Leyte.—Ten thousand pesos was available for widening the Liloan Channel and about 90 per cent of this sum was expended during the year for that purpose.

Cagayan, Oriental Misamis.—Good progress was made by Mr. C. V. Powers on his contract for an extension of the Cagayan reinforced concrete wharf 10 meters wide by 47.5 meters long. All piles were driven and all precast slabs were placed, amounting to about 60 per cent of the basic contract.

Mambajao, Oriental Misamis.—Construction of Mambajao Pier, Camaguin Island, was delayed by failure to receive a bid within the funds available. Work will be undertaken by administration when favorable weather sets in.

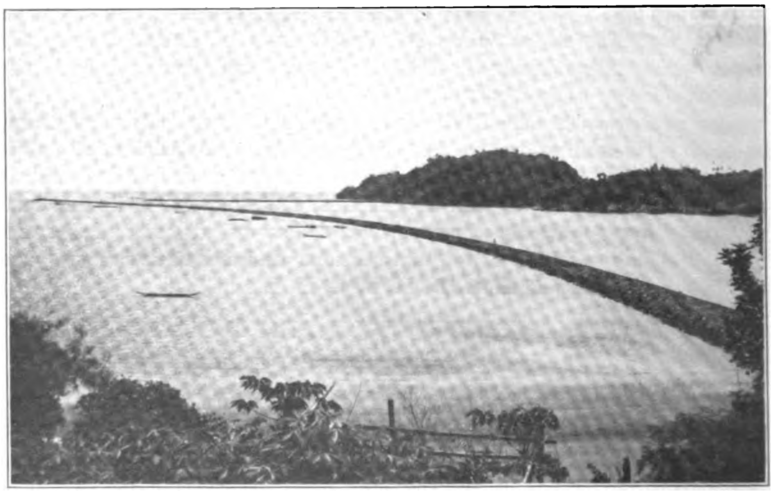
Jimenez, Occidental Misamis.—A survey and investigation was made of this project and a tentative layout was planned.

Pulupandan, Occidental Negros.—The only work accomplished during 1930 was on the connection of the provincial road to the pier. An asphalt pavement, 20 meters wide and about 180 meters long is being built across the reclaimed area. The work was 60 per cent completed at the close of the year.

San Carlos, Occidental Negros.—An investigation and survey of this port was undertaken and plans are in preparation for a landing to accommodate the launches plying between this port and the Island of Cebu.

Dumaguete, Oriental Negros.—In addition to a small amount of maintenance work, construction was started on a small reclaimed area and shed for the protection of passengers in inclement weather. Soundings were made over an area which may be developed into a basin for launches, etc., if conditions are favorable for dredging.

Puerto Princesa, Palawan.—A pier shed 8 by 17.4 meters, with a galvanized iron roof, was constructed, together with an additional shed over two approach spans at the land end of the wharf. A small amount of repair work was also done.



The Breakwaters, Port of Capiz, Capiz Province

HIGH SCHOOL ASSEMBLY HALL, LINGAYEN, PANGASINAN PROVINCE

Cuyo, Palawan.—A small amount of work was done on increasing the height of the wharf and causeway 0.8 meter, to prevent overwash by waves generated by the southwest monsoons. Approximately 5 per cent of the work was accomplished with the funds available.

Borongan, Samar.—An investigation, survey and study were made of the proposed improvement of the port of Borongan.

Calbayog, Samar.—A contract was awarded to Florentino C. Villa & Co. in the sum of approximately ₱26,000 for the delivery and placing of about 6,000 cubic meters of rock for the Calbayog jetties. It is expected that this quantity of rock will be sufficient to build 500 linear meters of jetty.

Catbalogan, Samar.—The rock causeway, 163 meters in length, was completed by contract. Plans were finished and the construction of a reinforced concrete pier 9 meters wide by 61 meters in length was advertised for bids.

Laoang, Samar.—A survey was made of this port with a view of possible improvement, which is now under study.

Amandayehan, Samar.—An investigation was made of this port and plans are in preparation for a landing to accommodate small boats plying between this place and Tacloban, Leyte.

Larena, Siquijor.—The work on the port of Siquijor consisted mostly in replacing the wooden substructure with reinforced concrete over which a new wooden deck was placed. The old bodega was torn down and reërected on a new reclaimed area 15 meters square placed on one side of the causeway, thus relieving the congestion of traffic on the causeway.

Jolo, Sulu.—No bid having been received, the work at this port, consisting of 75 linear meters of concrete gravity wall on a timber pile foundation, was started by administration in June, 1929 and at the end of 1930, 30 linear meters of wall were in place. Great difficulties were encountered in obtaining materials.

Surigao, Surigao.—A survey was made with a view to extending the present wharf and preventing further shoaling.

Mauban, Tayabas.—This project consists of 300 linear meters of rock causeway, 100 linear meters of reinforced concrete approach and a pier head 61 meters by 4 meters. Plans were prepared, and a contract was let to Mr. Luis L. Mallari for the first 90 linear meters of the causeway, 80 per cent of which was completed at the end of the year.

Siain, Tayabas.—An investigation and hydrographic survey of this port were made and plans were prepared for a rock causeway 40 meters long and a reinforced concrete pier with timber deck, 6.1 meters wide by 40 meters long. The contract for building this project was awarded to Mr. Luis L. Mallari.

Puerto Real, Tayabas.—Plans were prepared for a reinforced concrete pile wharf with timber deck, 6 meters wide by 13 meters in length, with 12 lineal meters of rock-fill approach. Owing to isolation of the project, construction was authorized to be done by administration.

Atimonan, Tayabas.—Plans were prepared for a reinforced concrete seawall, 1,190 linear meters in length to protect the foreshore facing the municipality of Atimonan. The contract for building this project was awarded to Mr. Luis L. Mallari.

MANILA

No new port works projects were undertaken during the year. The usual maintenance and repair of piers, wharves, cargo sheds, etc. was carried on, and a total of ₱140,000 was expended for those purposes. Piers Nos (3), (5) and (7) were in very good condition at the close of the year, but considerable work remains to be done on the repair of the marginal wharf between piers Nos. (3) and (5). The new hopper dredge which arrived in July, was put to work in August and is rendering very satisfactory service. The harbor on both sides of Pier 7 and the fairway will be dridged to a minimum depth of 35 feet by the end of January, 1931.

DREDGING OPERATIONS—1930

Location	Total 1902 to 1929	Total for 1930	Steamship *Dredger*	Dredges							Total
				Manila	No. 1	No. 3	No. 4	No. 5	No. 6	No. 7	
	Cubic meters	*Cubic meters*									
Lower Pasig River	8,829,420	370,900	261,500	76,200	27,360					5,840	9,200,320
Outer Harbor	6,190,479	870,400	35,000	515,400							6,760,879
Upper Pasig River	1,074,968	27,059				22,344		4,402	313		1,102,027
Inner Basin	660,951										660,951
Binondo Estero	84,305	73						73			85,878
Estero de la Reyna	299,706	15,092						15,092			314,798
Paco Estero	59,903										59,903
San Miguel Estero	78,267	2,197							2,197		80,464
Provisor Estero	40,276	1,659						1,659			41,935
Marine Ry Engineer Island	46,165										46,165
Talim Island (City)	1,071										1,071
Outer Bay	1,957,894	132,700	90,500	5,560	36,640						2,090,594
San Sebastian Estero	7,749										7,749
Magdalena Estero	16,580	15,139							15,139		31,719
Engineer Island Canal	40,740										40,740
Vitas Estero	893,000	44,010								44,010	937,010
Quiapo Estero	12,507										12,507
Segado Estero	35,509										35,509
Pandacan Estero	172										172
San Lazaro Estero	30,594										30,594
Corregidor Harbor (Q. M.)	63,746										63,746
Iloilo River	3,268,919	298,076					298,076				3,566,995
Cebu Harbor	556,707										556,707
Mariquina River	7,290										7,290
Balete Estero	32,362										32,362
District of Cavite	20,876										20,876
Tondo Beach	129,184										129,184
Santibañes Estero	25,878										25,878
Tanque Estero	28,057										28,057
Tacloban Wharf	34,505										34,505
Zamboanga Pier	29,880										29,880
Cotabato River	49,462										49,462
Earnshaw's Slipways	82,113	30,292	10,500	18,000				1,792			112,405
Los Baños Pier	11,160										11,160
U. S. Navy Yard, Cavite	1,316,160	40,800			40,800						1,356,960
Concordia Estero	16,298										16,298
Malabon Canal	36,821										36,821
Port Libas, Capiz	31,413										31,413
Napindan Bar	100,856	15,285				15,285					116,141
Polo Club	12,471										12,471
Sunog Apog Estero	14,850										14,850
Bankusay Estero	3,390										3,890
Varadero de Manila, Cavite	8,600										8,600
Ganado Estero	2,332										2,332
Total	26,243,586	1,563,682	417,500	615,160	104,800	37,629	298,076	23,018	17,649	49,850	27,807,268

TABLE A.—BRIDGES

[Year ending 1930]

Province	River	Road	Type	Remarks
Abra	Bancag	Tangadan–Bangued	Steel truss 37.4 m.	Preliminary plan and estimate.
Albay	Agus	Matacon–San Antonio	Steel truss 49.7 m.	Do.
Antique	Antique	San Jose–South	R. C. girder 72.0 m.	Do.
Bataan	Balsic	Bataan–Pampanga	R. C. girder 55.0 m.	Plans, estimate and specifications.
Do.	San Vicente (Orion)	Orion–South	R. C. girder 16.0 m.	Do.
Batangas	Malaking Ilog	Rosario–Taysan, Tayabas	Steel truss 25.0 m.	Preliminary plan and estimate.
Bohol	Manaba	Tagbilaran–East	Steel truss 99.8 m.	New preliminary plan and estimate.
Capiz	Mambusao	Ivisan–Sigma	R. C. girder 44.0 m.	Preliminary plan, estimate and 50 per cent final plans.
Do.	Panay	Asturias Sugar Central	Alteration of roadway and installation of sidewalks.	Plans and estimate.
Do.	Sook	Capiz–West	Suspension 91.5 m.	Rough estimate.
Do.	Ivisan	Capiz–South	R. C. girder 12.0 m.	Plans, estimate and specifications.
Cagayan	Babogan	Tuguegarao–Alcala	Steel truss 46.7 m.	Do.
Do.	Pared	Cagayan–Valley	Steel truss 148.9 m.	Do.
Camarines Sur	Agus	Bato–Polangui	Steel truss 74.7 m.	Do.
Do.	Bicol	Naga–Milaor	Steel truss 80.8 m.	Do.
Cebu	Paquigne	Cebu–South	R. C. girder 27.0 m.	Preliminary plan and estimate.
Davao	Talomo	Davao–South	Steel truss 25.0 m.	Plans, estimate and especifications.
Ilocos Norte	Bacarra	Laoag–Bacarra	Steel truss 297.7 m. plus 48 m. Approach.	New preliminary plan and estimate.
Do.	Badoc	Manila–North	R. C. girder 351.0 m.	Do.
Ilocos Sur	Amburayan	do	Steel truss 248.2 m. plus 96 m. Approach.	Plans, estimate and specifications.
Do.	Abra at Banaoang	do	Steel truss 296.8 m.	Do.
Iloilo	Lamonan	Passi–Calinog	Steel truss 31.2 m.	Do.
Do.	Tigbauan	Iloilo–South	R. C. girder 90.0 m.	Do.
Do.	Guimbal	do	Steel truss 347.8 m.	Do.
Do.	Jalaur	Pototan–Barotac	Steel truss 121.1 m.	Do.
Isabela	Pinacanauan	Ilagan–Tumawini	Steel truss 121.1 m.	Preliminary plan and estimate.
Do.	Calaoor Santiago	Santiago–Echagüe	Steel truss and R. C. girder 61.7 m.	Do.
Do.	Ganano	Echagüe–Cauayan	Steel truss and R. C. girder 65.7 m.	Plans, estimate and specifications.
Do.	Ipil	Santiago–Echagüe	Steel truss and R. C. girder 61.7 m.	Do.
Lanao	Agus	Camp Keithley–Dansalan	Steel truss 40.5 m.	Plans 90 per cent finished.
La Union	Bauang	Manila–North	Steel truss 545.8 m.	Preliminary plan and estimate.
Leyte	Calogcog	Polo–South	R. C. girder 27.0 m.	New preliminary plan, estimate and 75 per cent final plan.
Manila	Pasig	Calle Colgante	Steel truss, double roadway 242.8 m.	Plans 80 per cent finished.
Do.	do	Calle Mendiola	Steel truss, double roadway 251.6 m.	Plans 70 per cent finished.
Do.	do	Ayala Boulevard	Steel truss, double roadway 136.3 m.	Plans 30 per cent finished.
Do.	Manila Railroad	Azcarraga Extension	Timber truss, double roadway 286.8 m.	Preliminary plan and estimate.
Mindoro	Pula	Calapan–Pinamalayan	Steel truss 46.7 m.	New preliminary plan and estimate.
Do.	Magasawang tubig	do	Steel truss 121.1 m.	Preliminary plan and estimate.
Nueva Ecija	Peñaranda at Gapan	Manila–North	Steel truss 279.5 m.	Plans, estimate and specifications.
Nueva Vizcaya	Kirang	Cagayan–Valley	R. C. girder 72.0 m.	Preliminary plan and estimate.
Do.	Indiana	do	Steel truss 49.7 m.	Plans, estimate and specifications.
Occidental Negros	Himogaan	Bacolod–North	Steel truss 99.3 m.	Preliminary plan, estimate and 90 per cent final plan.
Do.	Sicaba	do	Steel truss 49.7 m.	Plans, estimate and specifications.
Do.	Sagay	do	R. C. girder 33.0 m.	Do.
Do.	Cawa	do	R. C. girder 20.0 m.	Do.
Oriental Misamis	Cagayan	Cagayan–West	Steel truss 198.5 m.	Do.
Oriental Negros	Guihulngan	Dumaguete–North	R. C. girder 40.0 m.	Preliminary plan and estimate.
Do.	San Jose	do	R. C. girder 297.0 m.	Do.
Do.	Ayungon	do	R. C. girder 45.0 m.	Plans, estimate and specifications.
Pangasinan	Pieng	Tayug–San Nicolas	R. C. girder 27.0 m.	Plans 75 per cent finished.
Do.	Tomana	Rosales–Villasisi	R. C. girder 18.0 m.	Plans 25 per cent finished.

MUNICIPAL BUILDING, DAVAO, DAVAO PROVINCE

TABLE A.—BRIDGES—Continued

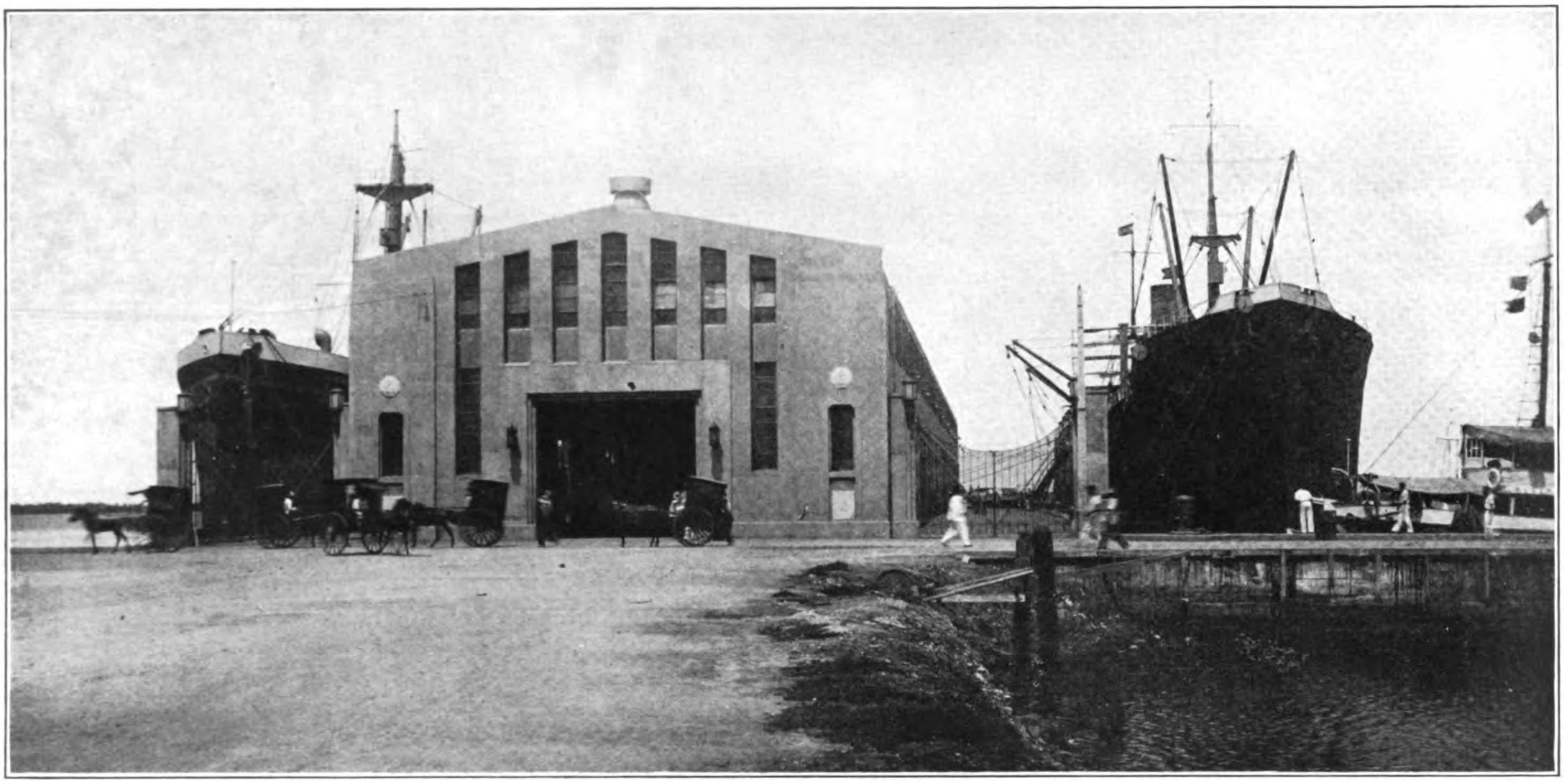
Province	River	Road	Type	Remarks
Pangasinan	Manila Railroad	San Fabian–Damortis	R. C. girder crossover 7.0 m.	
Rizal	Mauling	Taguig–Muntinlupa	R. C. girder 18.0 m.	Preliminary plans and estimate.
Do	San Juan	España Extension	R. C. girder 48.0 m.	Plans, estimate and specifications.
Do	Baras	Municipality of Baras	Arch, widening work 10.0 m.	Do.
Do	San Juan	San Felipe Neri	R. C. girder 55.0 m.	Redesign for wider roadway with sidewalks 75 per cent finished.
Samar	Borongan	Borongan–North	Steel truss 46.7 m.	Plans, estimate and specifications.
Sorsogon	Kagbacon	Sorsogon–Albay	Steel truss 28.2 m.	Preliminary plan, estimate and 50 per cent final plans.
Tarlac	Bayating	Tarlac–Camiling	R. C. girder 36.0 m.	Plans 90 per cent finished.
Do	Camiling	Camiling–Tarlac	Installation of escape cages	Plans and estimate.
Tayabas	Ibia	Tayabas–Lucban	R. C. girder 12.0 m.	Preliminary plan and estimate.
Do	Atimonan	Atimonan–Mauban	Suspension 103.6 m.	Do.
Zambales	Kalaklan	Olongapo–Subic	Steel truss 80.8 m.	Preliminary plan, estimate and scheme for temporary spans.
Standard	Manila Railroad	Overhead highway crossing	R. C. girder, single track, with R. C. piles 7.0 m.	Plans.
Do	do	do	R. C. girder, single track, with R. C. piles 7.0 m.	Do.
Do	do	do	R. C. girder, double track with R. C. piles 10.2 m.	Do.
Do	do	do	R. C. girder, double track, with R. C. piles 10.2 m.	Do.
Do			160-foot steel truss, 18-foot roadway with sidewalks.	Stress sheet and floor plans.
Do			12 M. R. C. girder, 8-meter roadway with sidewalks	Plans.
Do			11 M. R. C. girder, 8-meter roadway with sidewalks	Do.
Do			12 M. R. C. girder, 6-meter roadway with sidewalks	Do.
Do			9 M. R. C. girder, 6-meter roadway with sidewalks	Do.
Do			8 M. R. C. girder, 6-meter roadway with sidewalks	Do.
Do			7 M. R. C. girder, 6-meter roadway	Do.
A. G. and P. details			160-foot steel truss, 18-foot roadway with sidewalks.	Detailed plans checked.
Do			160-foot steel truss, 18-foot roadway without sidewalks.	Do.
Do			130-foot steel truss, 18-foot roadway with sidewalks.	Do.
U. S. S. P. details			do	Do.
A. G. and P. details			120-foot steel truss, 18-foot roadway without sidewalks.	Do.
Do			90-foot steel truss, 18-foot roadway without sidewalks.	Do.
Do			80-foot steel truss, 18-foot roadway without sidewalks.	Do.
Cagayan	Babogan	A. G. and P. shop	1–150-foot steel truss, 18-foot roadway	Fabricated steel inspected.
Nueva Ecija	Peñaranda	do	4–150-foot steel trusses, 18-foot roadway	Do.
Zambales	Cabangan	do	2–120-foot steel trusses, 18-foot roadway	Do.
Davao	Talomo	do	1–80-foot steel truss, 18-foot roadway	Do.
Cagayan	Pared	do	3–160-foot steel trusses, 18-foot roadway	Do.
Misamis Oriental	Cagayan	do	4–160-foot steel trusses, 18-foot roadway, with sidewalks.	Do.
Pangasinan	Paitan	do	1–160-foot steel truss, 18-foot roadway	
Iloilo	Jalaur	do	3–130-foot steel trusses, 16-foot roadway	Do.
Manila	Manila Railroad	Manila Railroad plans for overhead highway crossing plans checked.		
Do	Bureau of Posts		80-foot radio tower	
Do	Bureau of Education		R. C. bin	Design.

TABLE B.—PORTWORKS

Province	Port	Type of construction	Remarks
Agusan	Butuan	Improvement	Apron under construction.
Albay	Legaspi	do	East breakwater under contract.
Do	Tabaco	do	Plans completed. Timber wharf.
Antique	San Jose	Maintenance	
Batangas	Batangas	do	
Batanes	Basco Landing	Construction	Breakwater under construction.
Do	Uyugan	do	5 meter canal for bancas completed.
Bohol	Tagbilaran	Maintenance	
Do	Loay	do	Dredging in channel.
Cagayan	Aparri	Maintenance and improvement	Sea Wall under contract. River Training Works by administration.
Capiz	Capiz	Improvement	Breakwaters completed.
Do	New Washington	do	Bids called for wharf extension.
Cebu	Cebu	do	Pier No. 2 completed.
Do	Jagnaya	do	Under construction.
Do	Toledo	do	Causeway and landing completed.
Cotabato	Parang		Investigation completed.
Do	Glan	Improvement	Timber wharf, plans completed.
Davao	Davao	do	Sheet piling on hand to widen approach to pier.
Ilocos Norte	Currimao Landing	do	Completed.
Iloilo	Iloilo	do	Marginal wharf completed except riprap and fenders.
Lanao	Iligan	do	Nearing completion.
Leyte	Maasin	do	Plans nearing completion.
Do	Leyte	do	70 per cent complete.
Do	Tacloban	do	Plans nearing completion
Do	Liloan Channel	do	50 per cent complete.
Masbate	Masbate		No data.
Oriental Misamis	Cagayan	Improvement	Under contract, 60 per cent complete.
Do	Mambajao	do	Work by administration.
Occidental Misamis	Jimenez	do	Investigation and survey completed.
Occidental Negros	Pulupandan	do	Suspended, lack of funds.
Do	San Carlos	do	Plans under way.
Oriental Negros	Dumaguete	Maintenance	Area back of approach to be filled.
Palawan	Puerto Princesa	do	Repairs and shed construction.
Romblon	Romblon		No funds.
Samar	Borongan		Under investigation.
Do	Calbayog	Improvement	Jetty under contract.
Do	Laoang		Investigation and survey completed.
Do	Amandayehan	Improvement	Do.
Siquijor	Larena		No improvements proposed.
Sulu	Jolo	Improvement	Wall under construction.
Tayabas	Mauban	do	Contract for 100 linear meters of causeway let.
Do	Puerto Real	do	All piles cast, administration.
Do	Siain	do	Under contract.
Zamboanga	Zamboanga	do	Replacement of 144 linear meters temporary approach with concrete, 50 per cent complete.

TABLE C.—WIRING OF BUILDINGS, PARKS, FOUNTAINS, BRIDGES AND WHARVES

Province	Location	Type	Remarks
Albay	Tabaco	Presidencia	Completed by contract.
Do	Legaspi	Court and jail	Plans and contract.
Antique	San Jose	Provincial Hospital	Being done by contract.
Do	do	Capitol building	Plans furnished District Engineer.
Bataan	Orion	Orion River Bridge	Contract awarded.
Batangas	Bauan	Presidencia	Being done by contract.
Do	Batangas	High School	Plans, specifications and estimate.
Do	do	Trade School	Plans, specifications and estimate.
Bulacan	Malolos	Capitol building	Being done by contract.
Do	do	do	Do.
Do	do	Trade School	Plans, specifications and estimate.
Do	do	Provincial hospital	Being advertised for bids.
Do	do	Doctors' quarters	Do.
Do	do	Nurses' home	Do.
Capiz	Calivo	Provincial hospital	Completed by contract.
Cebu	Cebu	Trade School	Do.
Do	do	Extension of Southern Island Hospital	Plans and specifications.
Do	do	Maternity House	Plans under preparation.
Do	do	Cebu reinforced concrete pier cargo shed	Contract awarded.
Davao	Davao	Addition to Davao presidencia	Ready to award contract.
Ilocos Sur	Vigan	Capitol building (2 wings)	Completed by contract.
Do	do	Capitol building (main building)	Plans furnished District Engineer.
Iloilo	Iloilo	Iloilo Marginal Wharf	Plans completed.
Manila	Manila	Post-office building	Conduit work being done by contract. Wiring plan under preparation.
Do	do	Post-office garage	Ready to call for bids.
Do	do	Post-office bodega	Do.
Do	do	Library, University of the Philippines	Completed by contract.
Do	do	Rear wing, Rizal Hall, U. P.	Being done by contract.
Do	do	Human body crematory, San Lazaro Hospital	Completed by administration.
Do	do	Luneta Comfort Station	Plans furnished City Engineer.
Do	do	New Luneta band stand	Plans under preparation.
Do	do	Bureau of Science laboratory	Being done by contract.
Do	do	Manila West High School	Ready to call for bids.
Do	do	Malacañang Palace	One wing by administration.
Do	do	Proposed Electric fountains at Post Office	Plans completed.
Do	do	Jones Bridge lighting installation	Completed by contract.
Masbate	Masbate	Capitol Building	Plans and specifications.
Mountain Province	Baguio	Mansion House	Being done by administration.
Nueva Ecija	Cabanatuan	Provincial hospital administration building, ward pavilion and kitchen.	Being done by contract.
Do	do	Addition to Capitol Building	Plans completed.
Do	do	Addition to High School	Plans and specifications.
Do	Muñoz	Hospital, Central Luzon Agricultural School	Being done by administration.
Occidental Negros	Bacolod	Provincial Capitol	Completed by contract.
Do	do	High School	Plans furnished District Engineer.
Pampanga	San Fernando	Provincial hospital	Completed by contract.
Do	Magalang	Streets, school buildings, teacher and student cottages	Do.
Pangasinan	Lingayen	High School Assembly Hall	Do.
Do	do	Court House	Plans furnished District Engineer.
Rizal	Pasig	Provincial Capitol addition	Being done by contract.



PIER NO. 1, PORT OF CEBU

TABLE C.—WIRING OF BUILDINGS, PARKS, FOUNTAINS, BRIDGES AND WHARVES—Continued

Province	Location	Type	Remarks
Rizal	San Felipe Neri	Insular Asylum garage	Completed by contract.
Do	do	Insular Asylum chronic building	Do.
Do	do	Insular Asylum doctors' quarters	Do.
Do	do	Insular Asylum Therapy Cottages	Being done by administration.
Do		Insular Asylum infirmary	Plans.
Romblon	Romblon	Capitol Building	Plans and specifications.
Samar	Catbalogan	do	Being done by administration.
Sorsogon	Sorsogon	Provincial hospital	Completed by contract.
Tayabas	Sariaya	Presidencia	Being done by contract.
Zamboanga	Zamboanga	Hospital kitchen	Plans under preparation.

TABLE D.—OIL ENGINE DRIVEN ELECTRIC PLANTS

Province	Location	Type	Remarks
Abra	Lagangilang	Agricultural school electric lighting system	Advertising for bids, comparison and selection of bids and award of contract.
Batangas	Taal	Municipal electric light and pumping plant; additional generating unit.	Comparison and selection of bids. Contract awarded.
Camarines Sur	Pili	Agricultural school electric lighting system	Advertisement for bids and recommendation for purchases.
Capiz	Calibo	Hospital lighting and water supply	Completed by contract.
Manila	Trade School	Additional generating unit	Inspection and tests for acceptance. Completed.
Nueva Ecija	Cabanatuan	Government Center electric plant and power system extension.	Preliminary study completed.
Do	Muñoz	Agricultural school electric lighting system extension	Design and purchase of materials.
Occidental Negros	Isabela	Municipal lighting plant	Comparison and selection of bids and award of contract.
Pampanga	Magalang	Agricultural school electric lighting system	Inspection and test for acceptance. Completed.
Pangasinan	Lingayen	Provincial electric plant	Preliminary study and estimates made for extension of generating plant.
Tayabas	Sariaya	Municipal electric lighting plant; additional generating unit.	Plans, specifications, comparison and selection of bids. Contract awarded.

TABLE E.—HYDRO-ELECTRIC PLANTS

Province	Location	Type	Remarks
Laguna	Botocan Falls	Manila Electric Company's development	Inspection.
Do	Los Baños	Los Baños Quarry Hydroelectric Plant	Engineering supervision of mechanical and electrical features. Measurement and billing of power sold.
Lanao	Agus River system	Power possibilities	Discussion furnished to the office of the Governor-General. Recommendations about issue of limited rights made.
Mountain Province	Baguio	Hydro-electric Plant No. 2	Design of plant and specifications for penstock lines and generating equipment prepared.

PORT OF ZAMBOANGA, ZAMBOANGA PROVINCE

TABLE F.—PUMPING PLANTS

Province	Location	Type	Remarks
Bataan	Balanga	Waterworks plant—Oil engine drive	Plans and specifications prepared, bids received, contract awarded, near completion.
Batangas	Bolbok	do	Plans and specifications being prepared.
Bohol	Cortes	do	Do.
Bulacan	Bulacan	Waterworks plant—Electric drive	Completed, inspected, tested and accepted.
Do	do	Second pump unit—Electric drive	Plans and specifications prepared, bids received, and contract awarded.
Do	Hagonoy	Waterworks plant—Electric drive	Completed, inspected, tested and accepted.
Do	do	Second pump unit—Oil engine drive	Plans and specifications prepared, bids received, contract awarded and tested for acceptance.
Do	Malolos	Waterworks pump—Oil engine drive	Completed.
Do	Meycauayan	Waterworks plant—Electric drive	Completed, inspected, tested and accepted.
Do	do	Second and third pump units—Electric drives	Plans and specifications prepared, bids received and contract awarded.
Do	San Miguel	Fire pump set—Gasoline engine drive	Do.
Do	do	Second pump unit—Oil engine drive	Do.
Do	Santa Maria	Waterworks plant—Electric drive	Do.
Cebu	Cebu	Emergency extension work	Purchase and installation of three electric and two crude oil engine driven pumping units for emergency service due to water famine.
Do	do	Osmeña Waterworks	Recomendations for permanent improvement of water supply.
Cavite	Cavite	Second pump unit—Electric drive	Selected and recomended the purchase of pump unit.
Laguna	Calamba	do	Plans and specifications prepared, bids received, contract awarded, inspected, tested and accepted.
Do	Pagsanjan	Second pump unit	Study and estimate.
Manila	Post Office	Water supply	Plans and specifications, contract awarded.
Mountain Province	Baguio	Baguio City pumping plant	Specifications and selection of triplex pumping set.
Nueva Ecija	Muñoz	Pumping; line extension; construction of 50,000 gallon R. C. tank and transfer of 10,000 gallon steel tank.	Preparation of plans, purchase of materials, award of contract.
Occidental Negros	Silay	Fire pump set—Gasoline engine drive	Plans and specifications prepared, bids received, contract awarded.
Oriental Negros	Dumaguete	Second pump unit—Electric drive	Do.
Pampanga	San Fernando	Waterworks plant—Electric drive	Completed, inspected, tested and accepted.
Do	Guagua	do	Do.
Pangasinan	Dagupan	Waterworks plant	Preliminary study made.
Do	Rosales	do	Do.
Rizal	Antipolo	Second pump unit—Oil engine drive	Completed by administration.

REVETMENT ON THE TALISAY RIVER, BATAAN PROVINCE

TABLE G.—CALYX DRILLS

Province	Location	Name of project	Remarks
Agusan	Butuan–Cabadbaran Road	Taguibu River Bridge	Borings completed.
Bulacan	Malolos–Calumpit Road	San Marcos Bridge	Do.
Camarines Norte	Mambulao	Mambulao Mines	On rental to Philippine Mines, Inc.
Cagayan	Alcala–Lallo Road	Dumon River Bridge	Borings completed.
Do	Cagayan Valley Road	Maraburab River Bridge	Borings being taken.
Do	do	Pared River Bridge	Borings completed.
Do	Gattaran–Alcala Road	Nassiping River Bridge	Do.
Do	do	Piggatan River Bridge	Do.
Do	do	Pinacanauan River Bridge	Do.
Capiz	Capiz–East Road	Aranguel River Bridge	Do.
Do	Capiz–West Road	Macato River Bridge	Do.
Do	Sigma–Mambusao Road	Sigma River Bridge	Do.
Ilocos Norte	Laoag–Bacarra Road	Bacarra River Bridge	Do.
Ilocos Sur	San Ildefonso	San Ildefonso Port	Borings being taken.
Iloilo	Iloilo–South Road	Guimbal River Bridge	Borings completed.
Isabela	Santiago–Echague Road	Calao River Bridge	Do.
Do	do	Ipil River Bridge	Do.
Do	Echague–Cauayan Road	Ganano River Bridge	Do.
Leyte	Baybay–South Road	Banquerohan River Bridge	Do.
Do	do	Hamiluang River Bridge	Do.
Do	Baybay–Inopacan Road	Bitanjon River Bridge	Do.
Do	Dulag–Abuyog Road	Daguitan River Bridge	Do.
Do	Baybay–Abuyog Road	Gubang River Bridge	Do.
Do	Baybay–South Road	Hibagnan River Bridge	Do.
Do	do	Hilongos River Bridge	Do.
Do	Tacloban–Baybay Road	Inopacan River Bridge	Do.
Do	Maasin	Maasin Wharf	Borings being taken.
Manila	Over Pasig River	Mendiola Bridge	Borings completed.
Occidental Misamis	Jimenez	Jimenez Wharf	Do.
Pangasinan	Binalonan–Pozorrubio Road	Aloragat River Bridge	Do.
Do	Balungao–Umingan Road	Matablang River Bridge	Do.
Do.	Labrador	Oyong Creek Bridge	Do.
Do	Tayug–San Nicolas Road	Pieng River Bridge	Do.
Do	Bugallon	Salasa River Bridge	Do.
Do	Lingayen–Pao Road	Sapang River Bridge	Do.
Do	Balincaguin–Burgos Road	Tambacan River Bridge	Do.
Do	Rosales–Villasis Road	Tomana River Bridge	Do.
Tarlac	Tarlac–Camiling Road	Bayating River Bridge	Borings on first location completed.
Do	do	do	Borings on second location being taken.
Nueva Vizcaya	Cagayan Valley Road	Indiana River Bridge	Borings completed.
Zambales	Olongapo–Subic Road	Kalaklan River Bridge	Borings being taken.

TABLE H.—CEMENT GUN

Province	Name of project	Nature of work	Remarks
Cebu	Cebu Wharf	Various repairs on the concrete structure	Work still in progress.
Iloilo	Iloilo Marginal Wharf	do	Do.
Manila	Manila Piers	do	Do.

TABLE I.—MISCELLANEOUS MECHANICAL-ELECTRICAL

Province	Location	Name of project	Remarks
Antique	San Jose	Hospital electric lighting and hot water plant	Study and preliminary design.
Bulacan	Malolos	Crude oil engine for Trade School	Comparison and selection of bids. Purchase recommended.
Laguna	Los Baños	Extension of primary lines from College of Agriculture to School of Forestry.	Layout, bill of materials, selection of materials from bids.
La Union	San Fernando	Trade School jointer	Comparison and selection of bids. Purchase recommended.
Manila	Bureau of Science laboratory	Piping for gas, compressed air and vacuum	Plans furnished.
Do	Malacañang Palace	Kitchen equipment layout	Completed by administration.
Do	Post Office	Concrete tanks for sewage disposal	Plans and specifications. Contract awarded.
Do	do	Drinking water coolers and drinking fountains	Plans and specifications. Being advertised.
Do	do	Electrical fixtures	Specifications and selection from bids. Contract awarded.
Do	do	Elevators	Do.
Do	Insular Legislative Building	Rear entrance elevators	Preliminary estimates.
Do	Pandacan	Pandacan Research Laboratory refrigerating plant	Plans, specifcations and inspection. Equipment selected. Contract awarded.
Do	Rizal Hall	Gas piping	Design completed.
Do	San Lazaro	San Lazaro Hospital human body crematory	Installed by administration and put into operation.
Do	Santa Mesa	Road rollers	Inspection and test of Kaelble Road Rollers.
Do	do	do	Inspection and test of new Ruston Road Rollers.
Do	Pier No. 7	Spring collector shoes for gantry cranes	Design and working drawings completed.
Do	U. P. library	Electrical fixtures and fans for the reading room	Plans and details for installation. Bill of Materials. Advertised.
Do	General	Purchase of 19 crude oil road rollers in Europe	Specifications prepared. Bids passed upon.
Do	do	Standard cooling water system for crude oil engines	Designs and plans developed.
Do	do	Motor vehicles number plates	Study, preparation of design and specifications.
Mountain Province	Baguio	Camp 8 bridge	Rushed purchase of materials for repair of portion of bridge destroyed by fire.
Do	Kennon Road	Telephone line	Proposed contract with Manila Railroad Co. partly prepared.
Nueva Ecija	Cabanatuan	Municipal garbage incinerator	Design, plans and specifications completed by administration.
Do	Muñoz	Crude oil engine	Purchase recommended.
Do	do	Kitchen oil burners	Preliminary study completed.
Occidental Negros	Bago River	Rock crushing plant	Design, layout of plant, specifications. Equipment selected for preliminary development.
Do	Isabela	Electrical lighting distribution system	Bill of materials, selection from bids. Purchase recommended.
Pampanga	Arayat	New Arayat Quarry	Plans and specifications. Equipment selected.
Rizal	San Felipe Neri	Insular asylum refrigerating plant	Test of plant.
Do	do	Insular asylum garbage incinerator	Completed by contract.
Do	do	Hot water and steam cooking system	Plans and specifications completed. Waiting for funds.

TABLE J.—INVESTIGATION AND REPORTS

Province	Location	Type	Remarks
Insular	Bureau of Supply	Recommendations	Expert advice to purchasing agent on numerous bids.
Do	General	Standard specifications for mechanical and electrical plants.	Preparation of standard warranties, demonstration runs, test and payments and of general qualifications for materials and work.
Do	do	Motor vehicle registration fees	Study and recommendations for new system of fixing fees.
Do	do	Standardization of crude oil road rollers	Preparation of "Rules for Purchase," for the Standardization Committee.
Do	do	Amendments to Engineers Law	Study, comment and recommendation.
Do	do	Form of standard contract for use of power at canal chutes.	Completed and submitted for Department approval.
Do	do	Board of Examiners for Electrical Engineers	Furnished one member.
Do	do	Board of Engineers, advisors to Standardization Committee.	Furnished all members.
Do	do	Pensionado to U. S.	Recommendations for outline of work of pensionados in Motor Engineering and Naval Engineering.
Manila	Bureau of Civil Service	Assistance in the correction of examination papers	Furnished two members.
Do	City of Manila	Road roller wheels	Expert advice to Insular Auditor.
Insular	General	Controlograph for Government trucks	Inspection and report.
Manila	Meralco	High tension transmission line crossing provincial highways.	Recommended permits for Meralco high tension line to cross provincial highways.

DIVISION OF ARCHITECTURE

JUAN M. ARELLANO, *Acting Consulting Architect*

There were about one hundred forty-four insular and provincial projects, including important capitol buildings, the Mansion House in Baguio, the continuation of the Manila Post-Office Building and several buildings for the University of the Philippines submitted to this Office during the year for the preparation of necessary drawings. The drawings for some of these important projects are still in their preliminary stage and the working drawings cannot be completed as rapidly as desired due to lack of sufficient personnel to cope with the amount of work on hand.

The following tabulation shows the status of work on all projects submitted to the Division for study and the preparation of plans:

Name of projects	Character	Status
CAPITOL BUILDINGS		
1. Pasig Capitol Building	Working drawings	Completed.
2. Malolos Capitol Main building	do	Do.
3. Malolos Capitol Annex building	do	Do.
4. Samar Capitol Building	do	Do.
5. Masbate Capitol Building (Dumaguete type).	do	Do.
6. Cebu Capitol Building	do	Under preparation.
PROVINCIAL BUILDINGS		
7. Addition to Lucena Provincial Building.	Preliminary drawings	Completed.
8. Addition to San Fernando Provincial Building, La Union.	Working drawings	Under preparation.
9. Addition to Cagayan Provincial Building, Misamis.	do	Do.
10. Reconstruction of Abra Provincial Building, Abra.	do	Completed.
11. Lubuagan Subprovincial Building, Kalinga, Mountain Province.	do	Do.
12. Malaybalay Provincial Building, Bukidnon.	Preliminary drawings	Do.

Name of projects	Character	Status
PRESIDENCIAS		
13. Addition to Tuguegarao Presidencia Building, Cagayan.	Working drawings	Completed.
14. Addition to Santa Cruz Presidencia Building, Ilocos Sur.	do	Do.
15. Addition to Indang Presidencia Building, Cavite.	do	Do.
16. Addition to Paoay Presidencia Building, Ilocos Norte.	do	Do.
17. Addition to La Castellana Presidencia Building, Occidental Negros.	do	Do.
18. Addition to Silang Presidencia Building, Cavite	do	Do.
19. Addition to Aritao Presidencia Building, Nueva Vizcaya.	do	Under preparation.
20. Danao Presidencia Building, Cebu	do	Completed.
21. Cagayan Presidencia Building, Misamis.	Preliminary drawings	Do.
22. Bauan Presidencia Building, Batangas.	Working drawings	Do.
23. Calapi Presidencia Building, Bohol	(Magalang type)	Do.
24. Bigaa Presidencia Building, Bulacan.	(Clarin type)	Do.
25. Nampicuan Presidencia Building, Nueva Ecija.	do	Do.
26. Alcala Presidencia Building, Pangasinan.	do	Do.
27. Lupao Presidencia Building, Nueva Ecija.	(San Jose type)	Do.
28. Camulong Presidencia Building, Cagayan.	(Cainta type)	Do.
29. Solsona Presidencia Building, Ilocos Norte.	(Compostela type)	Do.
30. Sariaya Presidencia Building, Tayabas.	Working drawings	Do.
31. Small town Presidencia Building, Tayabas.	do	Do.
32. Asingan Presidencia Building, Pangasinan.	do	Under preparation.
33. Candon Presidencia Building, Ilocos Sur.	(Magalang type)	Completed.
34. San Juan Presidencia Building, La Union.	do	Do.
35. San Carlos Presidencia Building, Iloilo.	(Clarin type)	Do.
36. Barotac Presidencia Building, Iloilo	do	Do.
37. Sogod Presidencia Building, Cebu	(Compostela type)	Do.
38. Piat Presidencia Building, Cagayan	(Clarin type)	Do.
39. Pila Presidencia Building, Laguna	Working drawings	Do.
40. Pulupandan Presidencia Building, Occidental Negros.	(Davao type)	Do.
41. Mambulao Presidencia Building (remodeled), Camarines Norte.	Preliminary drawings	Do.
42. Pamplona Presidencia Building, Camarines Sur.	(Clarin type)	Do.
UNIVERSITY OF THE PHILIPPINES		
43. Auditorium for the University of the Philippines, Manila.	Preliminary drawings	Do.
44. Conservatory of Music, Manila	do	Do.
45. Fine Arts, Manila	do	Do.
46. Library Extension Building, Manila	Working drawings	Do.
BAGUIO MANSION HOUSE		
47. Annex to present Baguio Mansion House.	do	Do.
RECREATION HALLS		
48. Naga Recreation Hall, Camarines Sur.	Preliminary drawings	Do.
49. Rizal Memorial Forum, San Fernando, Pampanga.	do	Do.
50. Addition to Balete Rest House, Nueva Ecija.	Working drawings	Do.
COURT AND JAIL		
51. Conversion of present Trade School to Provincial Court and Jail, Albay.	do	Do.
MANILA POST OFFICE		
52. Post Office, Main Building, Manila	do	Do.
53. Post Office, Garage, Manila	do	Do.
54. Post Office, Property, Manila	do	Do.
SCHOOL BUILDINGS		
55. Sara School Building, Iloilo	(Standard No. 9)	Do.
56. Mahinog School Building, Addition and Alteration, Oriental Misamis.	Working drawings	Do.
57. Cavite High School Building, Cavite.	do	Do.
58. Malabanan School Building, Batangas.	do	Do.
59. La Union High School Building, San Fernando, La Union.	(San Fernando, Pampanga type).	Do.
60. Nagcarlang School Building, Laguna.	(Standard type)	Do.
61. Batangas High School Building, Batangas.	Working drawings	Do.
TRADE SCHOOL BUILDINGS		
62. Malolos Trade School Building, Bulacan.	do	Do.
63. Manila Trade School Building (Annex), Manila.	do	Under preparation.
64. Manila Trade School Building (Power House), Manila.	do	Completed.
TRADE SCHOOL BUILDINGS—continued		
65. Batangas Trade School Building, Batangas.	Working Drawings	Completed.
66. Dumaguete Trade School Building, Oriental Negros.	do	Do.
67. Albay Trade School Building, Albay.	Preliminary drawings	Do.
HOSPITAL, DISPENSARY AND LABORATORY BUILDINGS		
68. Infirmary building, Hospital, Manila.	Working drawings	Do.
69. Skin diseases building, Cebu	Preliminary drawings	Do.
70. Contagious diseases building, Cebu	do	Do.
71. Maternity house building, Cebu	Working drawings	Do.
72. T. B. Hospital, Zamboanga	do	Under preparation.
73. Misamis Hospital Building, Oriental Misamis.	do	Completed.
74. Malolos Hospital Building, Bulacan.	(Standard 20-bed Concrete type).	Do.
75. Contagious Hospital Building, Bacolod, Occidental Negros.	Preliminay drawings	Do.
76. Morgue and garage, Sorsogon	(Standard 1529)	Do.
77. Bureau of Science Laboratory, Manila.	Working drawings	Do.
78. Research Laboratory Annex, Pandacan, Manila.	do	Do.
OFFICE QUARTERS BUILDING		
79. Provincial commander office, Laguna.	do	Do.
80. Doctor's quarters, Insular Asylum, San Felipe Neri, Rizal.	do	Do.
81. Alienist quarters, Insular Asylum, San Felipe Neri, Rizal.	do	Do.
82. Doctor's quarters, Malolos Hospital, Bulacan.	do	Do.
83. Officers' quarters, Bacolod Hospital, Occidental Negros.	do	Do.
NURSES' QUARTERS		
84. Nurses' quarters, Sorsogon Hospital, Sorsogon.	do	Do.
85. Nurses' quarters, Malolos Hospital, Bulacan.	do	Do.
SERVANTS' QUARTERS		
86. Servants' quarters, deaf and blind, Pasay.	do	Do.
WELFAREVILLE, RIZAL		
87. Catholic chapel building	do	Do.
88. Protestant chapel building	do	Do.
89. Dormitory, small boys camp	do	Do.
90. Female prisoners	do	Do.
91. School building	do	Do.
BATH HOUSE		
92. Bath house, Naga, Camarines Sur	do	Do.
93. Bath house, Magdalena, Laguna	do	Under preparation.
SWIMMING POOL		
94. Magdalena Swimming Pool, Laguna		Do.
MONUMENTS		
95. Jose Rizal, monument, Santa Cruz, Laguna.	Preliminary drawings	Completed.
96. Jose Rizal base, monument, La Paz, Tarlac.	Working drawings	Do.
97. Jose Rizal monument, Solano, Nueva Vizcaya.	do	Do.
BAND STAND		
98. Rosales bandstand, Pangasinan	do	Do.
GATE		
99. Santa Rosa gate, Laguna	do	Do.
WAREHOUSE		
100. Estancia warehouse, Iloilo	do	Under preparation.
VAULT		
101. Cagayan register of deeds vault, Oriental Misamis.	do	Completed.
MARKET AND TIENDAS		
102. Naga, two-story market, Camarines Sur.	do	Do.
103. Pavia Market and tiendas, Iloilo	(Std. 18×34 m.)	Do.
104. Sinait Market and tiendas, Ilocos Sur.	(Std. 15×23 m.)	Do.
105. Tubao Market and tiendas, La Union.	(Std. 12×21 m.)	Do.
106. San Luis Market and tiendas, Pampanga.	(Std. 15×27 m.)	Do.
107. San Jacinto Market and tiendas, Pangasinan.	(Std. 21×25 m.)	Do.
108. Lupao Market and tiendas, Nueva Ecija.	(Std. 12×24 m.)	Do.
109. Cavinte Market and tiendas, Laguna.	(Std. 12×21 m.)	Do.
110. Badian Market and tiendas, Cebu	(Std. 12×21 m.)	Do.

Provincial Hospital Building, San Fernando, Pampanga

Name of projects	Character	Status
MARKET AND TIENDAS—continued		
111. Catbalogan Market and tiendas, Samar.	(Std. 12×48 m.)	Completed.
112. Santa Cruz Market and tiendas, Marinduque.	(B 21×36.10 m.)	Do.
113. Jaen Market and tiendas, Nueva Ecija.	(B 15×23 m.)	Do.
114. Magsingal Market and tiendas, Ilocos Sur.	(B 18×22 m.)	Do.
115. San Antonio Market and tiendas, Nueva Ecija.	(B 15×27 m.)	Do.
116. Bongabong Market and tiendas, Nueva Ecija.	(Std. 15×27 m.)	Do.
117. La Paz Market and tiendas, Tarlac	(Std. 12×25.50 m.)	Do.
118. Daet Market and tiendas, Camarines Norte.	(A 21×43.50 m.)	Do.
119. Daois Market and tiendas, Bohol	(Std. 15×31 m.)	Do.
120. Cabiao Market and tiendas, Nueva Ecija.	(Std. 15×27 m.)	Do.
121. Cabuyao Market and tiendas, Laguna.	(Std. 15×19 m.)	Do.
122. Lapog Market and tiendas, Ilocos Sur.	(Std. 12×48 m.)	Do.
123. San Joaquin Market and tiendas, Batangas.	(Std. 15×23 m.)	Do.
124. San Loon Market and tiendas, Balungao, Pangasinan.	(A 21×21.50 m.)	Do.
125. Lucena Market and tiendas, Tayabas.		
126. Zaragosa Market and tiendas, Nueva Ecija.	(Std. 15×27 m.)	Do.
127. Biñang Market and tiendas, Laguna.	(Std. 16×43 m.)	Do.
128. Abuyog Market and tiendas, Leyte	(Std. 15×23 m.)	Do.
129. Pandan Market and tiendas, Antique	(Std. 12×22 m.)	Do.
SLAUGHTERHOUSE		
130. Naga Slaughterhouse, Camarines Sur.	Working drawings	Do.
WATER TOWER		
131. Dagupan Water Tower and Rizal Monument, Pangasinan.	do.	Under preparation.
132. Muñoz Agricultural School Water Tower, Nueva Ecija.	Preliminary drawings	Completed.
BRONZE TABLET		
133. Bangui Presidencia Building, Ilocos Norte.	Drawings	Do.
134. Governor Ortega Bridge, San Fernando, La Union.	do.	Do.
135. L. Almeida Bridge, San Fernando, La Union.	do.	Do.
136. Sorsogon Provincial Hospital, Sorsogon.	do.	Do.
137. Sorrogon Rizal Monument, Sorsogon.	do.	Do.
138. Camacho Bridge, Balañga, Bataan	do.	Do.
139. Camilo Osias Bridge, San Fernando, La Union.	do.	Do.
140. Balasan Market, Iloilo	do.	Do.
141. La Paz Presidencia Building, Iloilo	do.	Do.
142. Guinolhungan Swimming Pool, Dumaguete, Oriental Negros.	do.	Do.
143. Alang-alang Swimming Pool, Leyte	do.	Do.
144. Diego Silang Bridge, Vigan, Ilocos Sur.	do.	Do.

IRRIGATION PROJECTS

There was one irrigation project completed, one under construction, 18 in operation, 3 approved for construction and 68 under consideration at the close of the year 1930.

The Peñaranda River Irrigation Project was practically completed during the past year and was officially opened on July 1, 1930. The project commands a total area of 18,000 hectares and its cost is approximately ₱3,400,000.

No work was done on the Dipolog Irrigation Project. It was recommended that legislative authority be requested to transfer this project to the municipal council of Dipolog, which initiated the project.

The 18 Government irrigation systems in operation during 1930 command an aggregate area of 88,200 hectares, and cost approximately ₱18,220,000.

The Pampanga River and the Balaoan Irrigation Projects and the extension of the Amburayan River Irrigation System were awaiting construction at the end of the year. They cover an aggregate area of 22,700 hectares and are estimated to cost, completed, ₱4,400,000. Authority to start the construction of the Pampanga River Irrigation Project, for which ₱600,000 had been released, was repeatedly requested during the past year.

After providing funds for projects under construction and approved for construction and improving existing systems, there will be left a balance of ₱135,360.43 from the ₱20,000,000 bond fund authorized by Acts 2940 and 3011.

A more detailed description of the irrigation projects completed during the past year, irrigation systems in operation, projects under construction, projects approved for construction and projects under consideration is given hereunder:

PROJECTS COMPLETED DURING 1930

The Peñaranda River Irrigation Project was officially opened on July 1, 1930, although it begun to divert water from the Peñaranda River as early as May 5, 1930.

The year 1930 saw the completion of four different contract jobs on this project, the most important of which were the excavation of the Main Canal by the Gordon and Haley Construction Company, subcontractors, and the excavation of the laterals and sublaterals by Sotero Baluyut, general contractor. Thoe Gordon and Haley Construction Company in 1929, took over the job of excavating the Main Canal which is approximately 8 kilometers long and with a maximum cut of 10.5 meters, moving over 240,000 cubic meters of earth. Steam shovels, derricks, draglines and various other earthmoving equipment were employed on this job which was completed in April, 1930. The excavation of the larger laterals and sublaterals was completed in June. The other jobs completed this year were the construction of small concrete structures and the construction of the spur dyke on the North Abutment. Both of these jobs were undertaken by S. Nagauye, contractor. The small structures which included turnouts, paddy drains, crossings, etc., were completed in February, having been started the year previous. The spur dyke was completed in July at a cost of ₱12,810.

The canals had been tested early in May and successful operation of the system was anticipated. Minor repairs and finishing of the canals were done by the Government after Sotero Baluyut, the contractor, had waived claims for the funds included in his contract for maintenance purposes.

Other jobs completed by Administration were the installation of a telephone system in February, and the completion of unfinished structures on the Main Canal in March. The repair, cleaning and painting of steel fixtures and parts of all structures was also undertaken, before the operation of the system. The repairs of breaks in the canals which occurred during operation also occupied some time of the government personnel, although the only work of this nature which was relatively large was the repair of Lateral C in September and October when sections of this canal were washed away by flood waters.

The weather during the past year was notably irregular—intense dry spells alternating with heavy rainfall. In this region, farmers usually start preparing their seed-beds near the close of May. However, May and June proved to be dry months, and the system was called upon to supply the water that is normally derived from the early rains. From July to the middle of October, heavy rains gave rise to several floods, which damaged parts of the system. The period from October 15 to the end of December was conspicuously deficient in rainfall. In fact, it was a period of drought in several places outside of the system.

Drainage presents the one great problem that remains to be solved for lands adjoining the southwestern section of the irrigable area. This section, mostly lowlands, is traversed by numerous creeks and sloughs, or "banas" as they are locally known, that regularly overflow their banks. The stormy rains that prevailed last July, caused the creeks, especially Saclang and Dumanas to overflow their banks every three days from the 1st to the 23rd, flooding the sections at the ends of Laterals D8 and D9. The drainage ditches which criss-cross these sections proved inadequate under the unusual conditions, and long submergence caused the destruction of the young rice plants. It was observed that Miao Creek contributed greatly to the inundations, taking in water from the Pampanga River whenever this rose up. As a means of relief, on August 15 to 20 the mouth of Miao Creek was closed with an earth dyke constructed jointly by the Government and tenants of the lands affected.

The service of water started with the preparation of the rice seed beds in May and June and continued on through the transplanting period and ending with the maturity of the crops on November 7. Adequate water supply was available throughout the year. From October 29 to November 4, rotation was adopted in the delivery of water. Laterals E and D started carrying water on May 5, and Lateral C on June 11. The system was closed down during days of heavy rains, especially during July.

The area irrigated during the year was 15,600 hectares and all observations and information gathered to date point to a bumper crop in this region. Practically all points within the system have realized increases in yield. The vigorous growth of the rice plants, their unprecedented stooling and height was conspicuous everywhere. It is estimated that from 30 to 40 per cent increased in yield was obtained in Gapan, and 20 per cent is believed to be a conservative estimate for San Miguel, Bulacan Province. There were no rice pests in any part of the irrigated area. In short, the system had, on the whole, a successful year.

IRRIGATION SYSTEMS IN OPERATION

Of the 18 Government irrigation systems in operation, only 14 were administered by this Bureau. The Naic System was operated by the Bureau of Lands, the Trinidad by the Bureau of Education, and the Sta. Maria and Ayala System by the municipal council of Zamboanga. A list of irrigation systems in operation is shown in Table I.

AGANAN

The exceptional drought experienced on this project after August 15, caused a reduction or total loss of crop on a portion of the irrigable area. Hence 319 hectares were recommended for exemption of irrigation charges and 1,247 hectares for the payment of operation and maintenance only. Full charges will be collected from 4,581 hectares only. Furthermore, to forestall any possible shortage of water in the future the irrigable area has now been limited to 5,698 hectares, which is still a little more than the area originally included in the project.

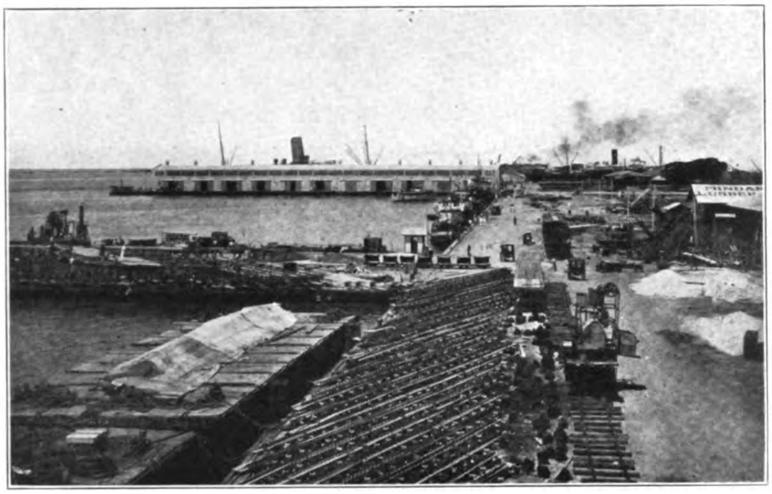
The water supply was distributed by rotation, but still great difficulties were experienced in distributing the water. Such difficulties arose as a result of unauthorized interference by irrigators.

Minor repairs were made at the headworks and also at drops where scour had taken place. Three new structures were completed and one sublateral was excavated.

The cost of operation and maintenance was well within the allowable maximum and the surplus will be used for needed improvements in the form of additional canals and structures.

AMBURAYAN

The system as a whole was satisfactorily operated during the year. The system provided sufficient water. Due to absence of farm ditches in the Luna District, however, some difficulties were experienced both because of lack of water and because of too much water. Lack of coöperation of the landowners in this district has resulted in slow construction of farm diches which has made regulation of the water supply somewhat difficult. The construction of farm ditches and structures has not been undertaken by the interested landowners as fast as desirable.



Cebu Waterfront near Pier No. 1, Port of Cebu

During the year three kilometers of farm ditches were completed and the following permanent structures:

1. Two pipe culverts under the provincial road.
2. Combined check and drop at end of Lateral H.
3. Combined check and turnout in bed of old Maluyo River.
4. Combined check and turnout in bed of old San Cristobal Creek.
5. Two earth dams across San Cristobal Creek.

The tunnel was cleaned of fallen rock and the sand deposited in front of headworks was cleaned out once during the year. The flow of San Cristobal Creek was diverted to the new Maluyo Channel.

The crop production as shown by records of yield on 62 lots shows an average of 40.4 cavans per hectare.

ANGAT

The system was successfully operated during the year. The water supply was ample for all requirements even though the rainfall in October and November was very scarce.

The cost of operation and maintenance was well within the sum provided for in the budget for 1930, the total sum spent amounting to ₱60,086.33, for a total area irrigated of 22,044.55 hectares. 2,068.5 hectares was irrigable but not cultivated this year.

The Superintendent reports an increase of about 20 per cent in yield over the production of 1929.

The sum of ₱22,562.90 was expended during the year for right-of-way, for construction of new canals and structures, and for the improvement and repair of existing structures.

The construction of the Angat Dike was done by contract at a total expense of ₱17,213.94, the work being begun in May and completed in August of the same year.

For 1931 the balance of the ₱125,000 released in March, 1929, amounting to ₱38,979.23, will be used to construct the following:

1. Panabatan Drainage	₱1,058.22
2. Lat. II-1-d-Extension	3,500.00
3. Completion of Lat. D4	1,500.00
4. Drainage, Bulihan, Malolos and Lat. E-2-a	2,239.15

The work of encouraging and helping farmers build farm ditches and drainage canals has been continued during the past year.

Floods during the year caused some damage to the dikes and silted up some canals. For the repair of such damages the sum of ₱10,000 was obtained from the Insurance Fund and some of the damaged canals have been repaired and cleaned, the remaining work to be done after the harvest season is over and the water supply can be shut off. The damages caused by the flood of September, 1929 have already been repaired.

BARUYEN

This project supplied water to 261.5 hectares of land during the year.

The sum of ₱5,000 was made available for the repair of canals and structures. The repairs consisted of replacing timbers in flumes, plastering the leaky canal banks with mortar and repair of concrete structures. Bids received for this work were considered too high and the work is being undertaken by administration. The work accomplished during the year was the repair of three Armco flumes and the plastering of 330 lineal meters of canal bank on Laterals A and B. The balance available is ₱1,659.92 with which the remaining repairs will be completed during the coming dry season.

DINGRAS

The project suffered damage from a typhoon in July when approximately one kilometer of the main canal was blocked by slides. The canal was opened for the passage of water before any damage was done to the growing crop. For the repair of this damage, the sum of ₱6,000 was released from the Insurance Fund. After the present harvest, the cleaning of the canal and repair of structures will be completed.

The construction of the new headworks, was advertised for bids and all were rejected because of unsatisfactory prices. The sum of ₱10,000 has been made available for this work and for certain improvements and repairs on canal structures and construction of new checks and turnouts.

The water supply was ample for all requirements and the crop was reported as satisfactory.

LAOAG—VINTAR

The completion of the South Side System was finally approved by the Department on September 10, 1930 and the sum of ₱147,000 was released by the Governor-General on September 17, 1930, pursuant to the recommendation made by the Bureau on January 7, 1929.

The funds were released for the following specific purposes:

(*a*) West Laoag Extension	₱30,000
(*b*) Dam and headworks	25,500
(*c*) Canal structures	47,500
(*d*) Excavation and repair of canals	29,000
(*e*) Telephone system	5,000
(*f*) Maintenance of South Side System	10,000
Total	147,000

Following advertisement of the different features of work involved the construction of West Laoag Extension and of canal structures was awarded to Mr. Agustin Maniñgat of Laoag, Ilocos Norte. The construction of the dam and headworks and the repair of canals was awarded to Mr. Que Chu. The Telephone system is being done by administration.

It is expected that all repairs and improvements including the completion of the West Laoag Extension will be completed before the next irrigating season.

The sum of ₱5,000 was made available for the operation and maintenance of the South Side System during the irrigating season of 1930. The system delivered water to lands on the South Side during that period.

O'DONNELL

Tne general drough experienced in other parts of the Islands was also experienced in this project.

The new sluiceway channel was completed in June. Due to this structure, the entrance of sand into the canal system was diminished and it is expected that in the future the heavy expense of annual sand removal from the Main Canal will be reduced to the minimum. The construction of this sluiceway was done by contract, the total cost of contract work being ₱37,613.29. The sum of ₱60,000 was available for the work done by contract and for the purchase of the Stoney Gate. Some of the falling shutters on the dam are in need of immediate repairs or replacement.

The sand deposits which accumulated in the Main Canal during the later part of the rice growing season were not entirely removed at the close of the year. Same will be removed during the coming dry season.

From the data furnished by the Superintendent of the system, it appears that a sum greater than ₱3 per hectare per year is advisable to efficiently operate and maintain the system and remove at once the sand deposits in the canals.

Court hearings in connection with collection of the 1928 irrigation charges from delinquent landowners were held on October 12 and 13, and December 11 and 12. This case has acquired a great importance as the delinquent landowners put up as defense the alleged lack of water of the O'Donnell River, and submitted as evidence against the Government the report on the project prepared by the Irrigation Investigating Committee. Hearings will be continued on January 28, 29, and 30, 1931.

PILAR

The system was successfully operated during the year under the supervision of the District Engineer. The area of this project is 170 hectares. No new structures were built during the year, the usual maintenance of the canal system being accomplished by the operating personnel.

The water supply during the year was ample for the needs of the project.

SANTA BARBARA

This project was satisfactorily operated during the year. The old wooden temporary canal structures were replaced with permanent concrete structures in several instances with funds from the operation and maintenance reserve.

The sluiceway gate originally constructed has been found to be unsatisfactory and a Stoney Gate is under construction by administration, all bids received for the work having been found too high. The sum of ₱45,000 has been made available for this work and for additional river protection work.

The upstream river protection work placed at the beginning of last irrigating season, to protect the headworks and banks from scour, has proven satisfactory and with the funds available for permanent work, no further trouble is anticipated from that source.

The water supply for this project was affected by the protracted drouth in the locality. However, the area affected was negligible and the crops on the project as a whole were satisfactory.

SIBALOM—SAN JOSE

The water supply on this project was adequate for the needs of the system from May to December. No damage occurred other than the usual damage to the rock-spur diversions in the Tipuluan River for the repair of which funds are available from river control funds set aside by the Legislature. The total sum of ₱4,918.17 was expended for this purpose during the year.

During the year 4 kilometers of farm ditches were constructed by the Government to improve the distribution of water, but approximately 23 kilometers of farm ditches remain to be constructed by the landowners. No new structures were constructed and necessary repairs were made to existing structures.

The area irrigated during the year was 4,500 hectares and the crop was considered to be the best of any so far produced since the system was opened. Only about 130 hectares were planted to late-maturing variety known as "Ramai" and this was found to give poor yields because of the rice pest locally known as "tanangao." It is believed that the planting of "Ramai" variety will be discontinued on this project.

The construction of the diversion works was advertised for bids and it is expected that the sluiceway and sluicegate will be completed in time for use during the next irrigating season and thereby keep sand out of the canals and improve the service by permitting continuous operation. In the past, it was necessary during floods to close the headgates to keep sand out of the system and to permit cleaning out of sand deposited in the canals and in front of the headworks.

It cost about ₱800 during the year for cleaning sand out of canals and in front of the headworks due to lack of a sluiceway.

TAGUDIN

The project was operated satisfactorily during the year. The water supply was sufficient for all needs. The average yield as shown by records of 119 lots shows 59.1 cavans per hectare.

There were no new canal structures built during the year. The lining of the tunnel was continued from January to June and a total of 150 lineal meters of roofing and siding was completed. There remains 283.7 lineal meters to be lined for which the sum of ₱25,000 is available from previous allotments and this sum is believed to be sufficient for the completion of the work.

The brush dam in the Chico River was repaired in November to insure the supply of water for the system. Such work was done with the aid of the irrigators.

No new service canals were constructed during the year, the system being well covered with such canals.

TALAVERA

The system was operated without difficulty until the latter half of October. Due to lack of rainfall, the water supply in the Talavera River diminished, and the distribution of water became a difficult problem. Rotation was practised, and the effect of the protracted drouth was thus kept to a minimum. The rains which came on December 12, and after this date, improved the water situation and helped in saving the late maturing varieties of rice from loss.

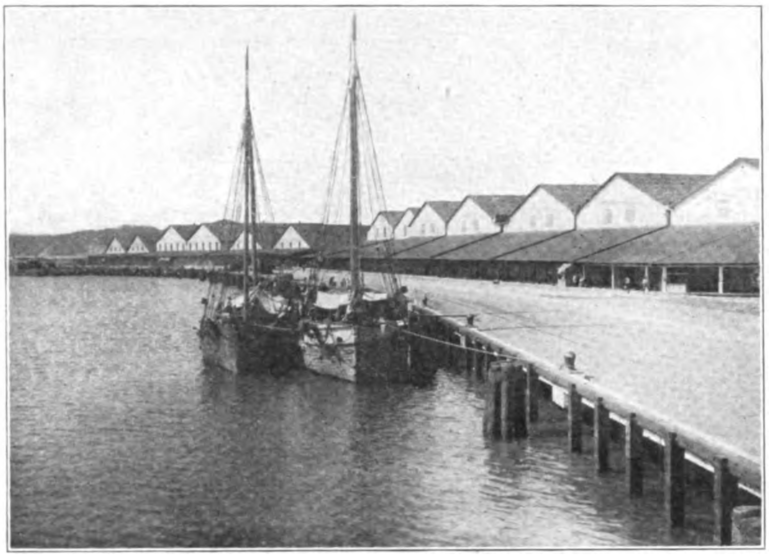
As a result of this drouth, 602 hectares were recommended for exemption of the irrigation charges, and 183 hectares for the payment of operation and maintenance charges only.

During the year, seven permanent new structures were completed to improve the delivery of water and ten old structures were repaired and improved. All this work was accomplished with the funds set aside for operation and maintenance for the year 1930.

The total area irrigated during the year was 9,512 hectares and the crop production is believed to compare favorably with that of preceding years.

STATEMENT OF COLLECTION OF IRRIGATION CHARGES FOR 1930 AS SHOWN BY REPORTS OF SUPERINTENDENTS OF IRRIGATION SYSTEMS.

Name of system	Year	Amount collectible	Amount collected	
Date Off. Opening—Jan. 1	1925	....	....	
	1926	₱12,528.01	₱12,785.87	To Dec. 31, 1930.
Aganan (₱11.66)	1927	72,421.95	67,755.61	
	1928	72,421.95	65,274.81	
	1929	72,005.86	50,467.84	
Total	......	230,377.77	196,284.13	
Date Off. Opening—July	1926	....	....	
	1927	12,080.00	6,444.85	Up to Dec. 31, 1930.
Amburayan (₱12.00)	1928	48,000.00	34,440.93	
	1929	48,000.00	28,873.88	
Total	......	108,080.00	69,759.66	
Date Off. Opening—May and July, 1926.	1927	75,931.90	62,986.13	As per report up to November, 1930.
Angat (₱12.00)	1928	186,964.91	182,782.31	
	1929	227,682.80	117,098.74	
Total	......	490,579.61	312,867.18	



The New Marginal Wharf, Port of Iloilo

STATEMENT OF COLLECTION OF IRRIGATION CHARGES FOR 1930 AS SHOWN BY REPORTS OF SUPERINTENDENTS OF IRRIGATION SYSTEMS—Continued.

Name of system	Year	Amount collectible	Amount collected	
Date Off. Opening—Jan	1924	....	2,097.29	
	1925	....	2,050.20	Area irrigated each up to 1929 not known.
Baruyen (₱12.00)	1926	....	1,178.62	
	1927	....	87.77	
	1928	....	81.73	
12 × 250 hectares	1929	3,000.00	23.32	
Total	......	3,000.00	5,518.93	
Date Off. Opening—Jan	1923	....	8,492.53	
	1924	8,933.48	8,401.19	
	1925	9,954.11	7,351.94	
Dingras (₱9.71)	1926	10,050.26	8,127.63	
	1927	10,062.68	7,485.71	
	1928	10,062.68	6,574.27	
	1929	10,062.68	2,057.59	
Total	......	59,225.89	48,490.86	
Date Off. Opening—Jan	1927	....	2,046.57	
O'Donnell (₱10.88)	1928	13,120.00	9,636.74	To Dec. 31, 1930.
	1929	43,520.00	6,487.51	
Total	......	56,640.00	18,170.82	
	1924	2,567.35	2,549.57	
	1925	2,567.35	2,073.25	
	1926	2,567.35	2,417.18	
Pilar (₱14.92)	1927	2,567.35	2,402.60	
	1928	2,567.35	1,561.14	
	1929	2,567.35	151.15	
Total	......	15,404.10	11,154.89	
Date Off. Opening—July	1926	....	....	
At ₱3.14 per Ha	1927	10,833.00	2,994.38	To Dec. 31, 1930.
At ₱8.34 per Ha	1928	29,190.00	25,841.35	
Sibalom at ₱8.34 per Ha	1929	29,190.00	17,325.59	
3,500 at ₱8.35 per Ha				
1,000 at ₱3.14 per Ha				
Total	......	69,213.00	46,161.32	
Date Off. Opening—Jan	1923	....	....	
	1924	17,834.75	17,577.25	To Dec. 31, 1930.
	1925	49,020.35	48,607.33	
Santa Barbara (₱10.11)	1926	49,020.35	47,227.75	
	1927	49,299.59	46,784.97	(Area to be revised for 1930.)
	1928	49,296.49	44,831.85	
	1929	49,296.49	34,941.98	
Total	......	263,768.02	239,971.13	
Date Off. Opening—Nov.	1923	....	....	
	1925	63,206.23	63,201.62	To Dec. 31, 1930.
Talavera (₱9.21)	1926	69,073.30	68,929.32	
	1927	72,696.63	71,859.22	
	1928	75,066.99	71,807.02	
	1929	80,659.60	68,026.71	
Total	......	360,702.75	343,382.89	
Date Off. Opening—Jan	1926	....	....	
	1927	5,640.00	4,163.39	
Tagudin (₱12.00)	1928	14,400.00	11,744.12	To Dec. 31, 1930.
	1929	14,400.00	7,916.93	
Total	......	34,440.00	28,824.44	
Total collections	......	....	1,315,586.25	

TABLE I.—IRRIGATION SYSTEMS IN OPERATION

Name of irrigation system	Classification	Province	Date of official opening	Irrigable area	Cost of construction	Average yield cavans per hectare		Number of water masters	Number of ditch tenders	Other employees	Plan of payment	
						By province	By systems				Amortization	Assessment
				Hectares	*Pesos*							
1. Aganan River	Insular	Iloilo	Jan. 1, 1925	6,300	₱917,000	17.56	47.6	3	17	6	₱11.65	
2. Amburayan River	do	La Union	June 1, 1926	4,000	1,156,000	23.77	59.8	2	11	5	18.29	₱12.00
3. Angat River	do	Bulacan and Pampanga	July 1, 1926 May 1, 1926	24,000	5,323,769	27.73	60.0	11	61	52	15.11	12.00
4. Ayala	Municipal	Zamboanga	Feb. 1924	180	17,000	14.30	60.0					
5. Baruyen River	Insular	Ilocos Norte	Jan. 1, 1924	250	94,000	19.98	40.0	1	2	1	27.75	12.00
6. Dingras	do	do	Jan. 1, 1923	1,028	140,000	19.98	40.8	1	3	2	12.29	9.71
7. Laoag-Vintar	do	do	Jan. 1, 1929	3,000	2,457,000	19.98						
8. Naic	do	Cavite	July 1, 1928	680	292,000	23.76					22.26	
9. O'Donnell River	do	Tarlac	Jan. 1, 1927	4,012	710,000	22.00	40.6	2	10	4	12.79	10.88
10. Peñaranda River	do	Nueva Ecija	July 1, 1930	17,300	3,404,185	43.92					13.44	11.60
11. Pilar	do	Bataan	Sept. 1, 1916	170	27,600	30.21	73.0				14.94	
12. Santa Barbara	do	Iloilo	Dec. 1, 1922	5,000	737,000	17.56	41.9	2	13	6	12.41	10.11
13. Santa Maria	Municipal	Zamboanga	Feb. 1924	430	23,000	14.30						
14. San Miguel	Special	Tarlac	Aug. 1913	6,400	789,000	22.00	40.0	1	2	7		
15. Sibalom-San Jose	Insular	Antique	July 1, 1926	4,520	450,000	18.86	40.8	3	21	13	13.44	11.48
16. Tagudin	do	Ilocos Sur	Jan. 1, 1926	1,269	425,000	21.01	57.9				21.60	12.00
17. Talavera River	do	Nueva Ecija	Nov. 15, 1923	9,457	1,218,000	30.00	66.6	3	27	8	9.21	
18. Trinidad	Special	Mountain Province	Jan. 1921	200	40,000	14.37						
Total				88,196	18,220,554							

Nos. 4 and 13 Operated by Municipal Council of Zamboanga. No. 8 Operated by Bureau of Lands. No. 18 Operated by Bureau of Education.

TABLE II.—IRRIGATION SYSTEMS APPROVED FOR CONSTRUCTION

Name of irrigation system	Classification	Province	Irrigable area	Estimated cost	Remarks
			Hectares		
1. Amburayan River Extension	Insular	La Union	1,200	₱250,000	Construction of this project held pending final action on Balaoan Project.
2. Balaoan River	do	do	1,000	150,000	Construction held pending action of Provincial Board.
3. Pampanga River	do	Nueva Ecija	20,500	4,000,000	Construction held pending release of funds by the Department.
Total			22,700	4,400,000	

IRRIGATION SYSTEMS UNDER CONSIDERATION

PRELIMINARY STUDIES COMPLETED

Province	Project	Irrigable area	Estimated cost	Remarks
		Hectares		
1. Ilocos Norte	San Nicolas Extension—Laoag-Vintar Irrigation System.	1,500	₱256,000.00	
2. Ilocos Sur	Candon	1,290	134,000.00	
3. Ilocos Sur	Santa Cruz	1,170	257,000.00	
4. Ilocos Sur	Santa Lucia	1,380	106,000.00	
5. Iloilo	Jalaur River	15,800	4,540,000.00	
6. Iloilo	Sibalom River	1,760	267,000.00	
7. Laguna	Santa Cruz	5,000	1,330,000.00	
8. Leyte	Barugo	755	240,000.00	
9. Mountain Province.	Mainit-Bontoc	490	117,000.00	
10. Nueva Vizcaya	Murong	1,870	130,000.00	
11. Palawan	Iwahig	700	60,000.00	With free labor.
12. Pampanga	Lower Pampanga River.	11,000	3,480,000.00	Studies made.
13. Pangasinan	Agno River	43,150	8,000,000.00	
14. Rizal	Baras	320	58,000.00	
15. Rizal	Morong	320	72,500.00	
16. Rizal	Pililla	300	60,000.00	
17. Tarlac	Tarlac River	20,720	4,200,000.00	Landowners opposed to construction.
18. Zambales	Santo Tomas	6,000	935,000.00	
	Total	115,525	24,242,500.00	

TOPOGRAPHIC SURVEY COMPLETED

Province	Project	Irrigable area	Remarks
1. Bataan	Orion	1,270	
2. Camarines Norte	Daet	2,000	
3. Camarines Norte	Talisay-Indan	5,000	
4. Camarines Sur	Panili Valley	2,000	
5. Cavite	Maragondon	1,400	
6. Iloilo	Pototan	2,300	Survey and preliminary design made.
7. La Union	Bacnotan	1,000	
8. La Union	Rosario	1,000	
9. Occidental Negros	Bago	20,000	Preliminary estimate of cost made.
10. Occidental Negros	Binalbagan-Himamaylan	3,000	
11. Pampanga	Bamban River	3,000	
12. Pampanga	Gumain River	5,000	
13. Pampanga	Porac River	1,000	
14. Pangasinan	Banila River	5,000	(Act No. 2755).
15. Pangasinan	Mangatarem River	2,000	Recommended for construction.
16. Pangasinan	San Fabian	4,000	Do.
17. Rizal	Mariquina Valley	5,000	
	Total	63,970	

AWAITING INVESTIGATION

1. Abra	Abra River	4,000	
2. Albay	Quinali-Lake Bato	6,000	
3. Albay	Malinao-Tabaco	600	
4. Bataan	Dinalupihan	2,500	
5. Batangas	Balayan	300	Investigation in progress.
6. Batangas	Batangas	1,000	Do.
7. Batangas	San Juan de Bocboc	1,000	
8. Camarines Sur	Barit River	2,000	
9. Camarines Sur	San Jose-Hagonoy	5,000	
10. Capiz	Maayon	2,000	
11. Capiz	Ibajay	500	Preliminary investigation 1911.
12. Capiz	Macato-Malinao	1,200	Do.
11. Capiz	Mambusao	1,000	Do.
14. Cebu	Balamban River	1,200	
15. Ilocos Sur	Abra River	10,000	Preliminary survey completed 1908.
16. Ilocos Sur	Santa Maria	1,200	Rough estimate for improving the system—₱15,000.
17. Isabela	Magat River	40,000	
18. La Union	Agoo-Tubao	2,000	
19. La Union	Naguilian	1,000	Preliminary survey completed.
20. La Union	San Juan	1,000	
21. Leyte	Palo River	1,000	Preliminary investigation completed.
22. Leyte	Dagami-Tanawan	14,000	
23. Leyte	Bato-Hilongos	3,000	
24. Mindoro	Bucayao River	2,000	
25. Nueva Ecija	Cabu River	7,000	Municipalities of Cabanatuan, Santa Rosa, San Leonardo, Papaya.
26. Occidental Negros	Silay	5,000	
27. Oriental Negros	La Granja Extension Station.	200	Investigation in progress.
28. Oriental Negros	Tanjay	800	
29. Oriental Negros	Tolong	3,000	Preliminary investigation made.
30. Pangasinan	Sinolocan River		Municipalities of Mapandan, Mangaldan, Calasiao, Santa Barbara, Malasiqui.
32. Tayabas	Mayao	2,500	
32. Zambales	Iba	400	Preliminary survey completed.
33. Zambales	Toton-Lanom	600	Do.
	Total	123,000	

WATER RIGHTS

A total of 217 new applications were received during 1930 as against 255 in 1929.

On December 31, 1929, there were 149 applications not acted upon, 126 of which were for irrigation, 11 for power development, 3 for condensation, 8 for domestic and one for mining purposes.

Of the 217 new applications received during 1930, 193 were for irrigation, 21 for power development, 2 for condensation and one for domestic purposes. There were, therefore, in 1930 366 applications under consideration.

A total of 198 applications were finally acted upon, 173 of which were granted, and 25 disapproved by the Honorable, the Secretary of Commerce and Communications, upon the recommendation of the Irrigation Council. Of the 173 approved applications, 155 were for irrigation, 7 for water development, 2 for condensation, 8 for domestic mining purposes. Of the 25 disapproved applications, 24 were for irrigation and one for power development purposes. There were two applications cancelled, one for irrigation and the other for power development purposes, the latter being the application of the Manila Electric Co. for water rights on the Caliraya River, which was withdrawn by the applicants.

At the close of 1930, there were pending for consideration 166 applications, 139 of which were for irrigation, 23 for power development, 3 for condensation and one for domestic purposes as may be seen in the following tabulation:

Applications	Pending 1928	Received 1930	Under construction	Approved 1930	Disapproved 1930	Cancelled 1930	Pending 1930	Remarks
Irrigation	126	193	319	155	24	1	139	82 not yet published
Power development	11	21	32	7	1	1	23	12 not yet published.
Condensation	3	2	5	2	......	......	3	
Domestic	8	1	9	8	......	......	1	
Mining	1	......	1	1	......	......	......	
Totals	149	217	366	173	25	2	166	

There were more applications for irrigation purposes approved in 1929 than in 1930 but the total area of the lands to be irrigated upon which water rights were granted as covered by applications approved in 1930 is greater than the total approved in 1929, as may be seen in the following tabulation:

Year	Number of application approved	Area in hectares
1929	185	15,451.45
1930	155	53,829.33

There were seven applications for power development approved in 1930 for developing a maximum of 7,043 horse power as against five applications approved in 1929 for developing a maximum of 6,711 horse power.

The Irrigation Council met four times during the year 1930 and acted upon a total of 198 water rights applications and two rules and regulations of irrigator's associations.

A considerable number of water rights controversies have been investigated and acted upon by the Honorable, the Secretary of Commerce and Communications in accordance with the recommendation of the Director of Public Works. Several complaints regarding the closing and appropriating of channels of public streams have also been investigated. Among these complaints are the complaints of the municipal councils of Macabebe and Masantol against Bibiano Barreto, Ayala y Cia. and Roman Santos, and that of several residents and the Municipal Council of Hagonoy, Bulacan against fishpond owners in the said municipality which may result in a court litigation, should the parties concerned fail to comply with the decisions of the Honorable, the Secretary of Commerce and Communications in the administrative investigations of said complaints.

Diversion Weir, Ivisan-Capiz Waterworks, Capiz Province

There are four streams which were designated for adjudication of water rights during the year 1930. They are the Batacan River in Tarlac and Pangasinan, Tubig ñg Bayan River in Tayabas and Batangas, Maduñgun River in Ilocos Norte and Calarlan and Bigol Creeks in Pangasinan.

The total number of streams so far adjudicated is 30. The final lists of priorities for the Banila River in Pangasinan, Nueva Ecija and Tarlac, Andulan or Borobor and Parasapas Rivers in Pangasinan and Bued or Nantayañgan River in Nueva Ecija and Pangasinan and their tributaries have already been prepared and ready for publication.

Stream	Year adjudication authorized	Province	Number of diversion ditches	Length of main canals in meters	Number of municipalities affected	Approximate number of hectares of land irrigated
Parasapas River	1916	Pangasinan	2	500	2	27
Banila River	1919	Pangasinan, Nueva Ecija and Tarlac.	50	10,000	10	14,414
Andulan or Burubor River	1921	Pangasinan	30	1,000	1	434
Bued or Nantayañgan River.	1922	Pangasinan and Nueva Ecija.	10	1,000	2	396
Total	......	......	......	......	......	15,271

Provisional lists of priorities for the following streams which have been surveyed and investigated are being prepared:

Stream	Year adjudication authorized	Province	Number of diversion ditches	Length of main canal in meters	Number of municipalities affected	Approximate number of hectares of land irrigated
Cut-Cut River and Sugu and Buho Esteros.	1918	Tarlac	......	......	1	8,000
Parua River	1924	Pampanga and Tarlac.	......	......	3	11,000
San Juan River	1926	Bataan	14	12,900	1	190
Total	......	......	......	......	......	14,190

Surveys are in progress with a survey party in the field on the following stream:

Stream	Year adjudication authorized	Province	Number of diversion ditches	Length of main canal in meters	Municipality affected	Approximate number of hectares of land irrigated
Pagang Creek	1928	Mountain Province.			Sadang[e]	500
Total						500

Surveys and investigations on the following streams have been suspended due to lack of funds:

Stream	Year adjudication authorized	Province	Municipalities affected	Approximate area of land irrigated in hectares
Maoguing-oguing River	1919	Ilocos Norte	Dingras	500
Lubnac Esteros	1920	do.	Sarrat	300
Burnay River	1921	do.	Solsona and Dingras	1,500
Nagdosangan River	1922	do.	Piddig	800
Maolo River	1922	Pangasinan	Sison and Pozorubio	2,500
Padsan River	1928	Ilocos Norte	Banna	1,900
Baloc River	1924	Pampanga and Tarlac.	Mabalacat, Magalang and Concepcion.	2,000
Total				9,500

The streams which have been designated for adjudication on which no work has been accomplished are given below:

Stream	Year adjudication authorized	Province	Municipalities affected	Approximate area of land irrigated in hectares
Ynarihan River	1915	Camarines Sur	Naga, Magarao and Calabanga.	1,200
Balingacay Estero	1919	Ilocos Norte	Sarrat	300
Danglayan River	1922	Ilocos Sur	Narvacan	2,200
Codoog or Barañgubang	1922	do.	Narvacan and Nagbukol	1,000
Plac Estero	1922	Tarlac	Moncada and San Manuel.	5,000
Zagubunbun Estero	1923	Ilocos Norte	Badoc	300
Imanduyan or Aleragat River.	1924	Pangasinan	Mapandan, Manaoag, Binalonan Pozorubio and Sison.	5,000
Del Carmen Creek	1924	Pampanga	San Fernando and Mexico.	5,000
Matua Creek	1924	do.	Santa Rita, Guagua, Bacolor and Porac.	800
Labasin and Bulaquin Rivers.	1925	Lgauna and Tayabas.	Tiaong, Dolores and San Pablo.	300
Lucuno Spring	1926	Abra	Bangued and Peñarubia.	300
Lagasit River	1926	Pangasinan	Tayug, Santa Maria, San Quintin, Rosales and Balungao.	2,000
Santa Maria or Villavieja River.	1926	Ilocos Sur and Abra	Narvacan, Santa Maria and Pilar.	2,000
Paed River	1926	Pangasinan	Alaminos	300
Talavera River	1927	Nueva Ecija	Carranglan, Muñoz, Santo Domingo, Talavera, Quezon, Aliaga and Zaragoza.	9,000
Gasgas River	1927	Ilocos Norte	Solsona	551
Coagusan, Balucco and Paligue Creeks.	1927	Tarlac	Concepcion	2,000
Mitura and Macalong Rivers.	1927	Pangasinan	San Manuel, Asingan, Binalonan and Mapandan.	8,000
Paranum and Pandacaqui Creeks.	1928	Pampanga	Angeles, Arayat, Mabalacat, Mexico and Magalang.	4,000
Til-layan Creek	1929	Ilocos Norte	Badoc and Nueva Era	100
Madamag River	1929	do.	Dingras	300
Salpad-Nabsoñgan Spring.	1929	do.	Piddig	100
Batacan River	1930	Tarlac and Pangasinan.	San Clemente and Mangatarem.	1,500
Tubig ñg Bayan River	1930	Tayabas and Batangas.	Tiaong, Rosario, and Bolbok.	500
Maduñgon River	1930	Ilocos Norte	Solsona, Dingras and Sarrat.	500
Calarian and Bigol Creeks.	1930	Pangasinan	Urdaneta, Santa Barbara and Malasiqui.	500
Total				52,751

There were no certificates of apportionment of water according to priority issued during 1930, except nine certificates of water rights. There were still pending about 5,000 certificates of apportionment of water according to priority on the Calaguiman River in Bataan and Paoay Lake in Ilocos Norte.

HYDROGRAPHIC INVESTIGATIONS

Hydrographers of the Division made 822 discharge measurements at permanent gaging stations and 80 discharge measurements at temporary gaging stations during 1930. Gagekeepers kept daily gage heights records at 102 permanent gaging stations. Systematic gagings of all main canals and some of the larger laterals of Government irrigation systems in operation were also made. Records were kept for 36 gages established in localities distant from the Weather Bureau's gages. Hydrographs showing, "weekly mean," "mean wet," "mean dry" and "absolute minimum" for each permanent gaging station were plotted and traced.

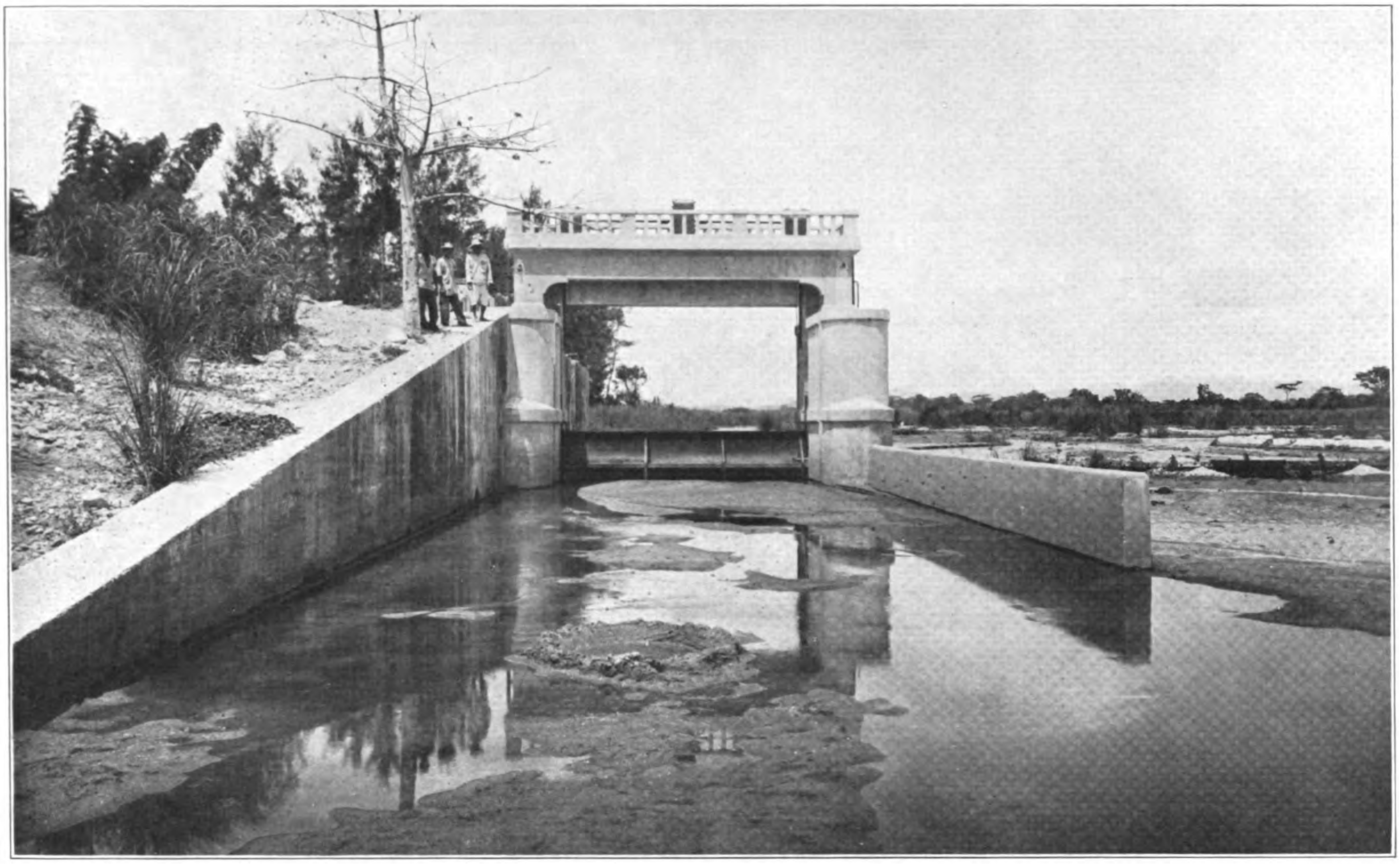
RIVER CONTROL PROJECTS DURING 1930

There were 9 river control projects during 1930 for which funds were made available. With the exception of item 8 which was done by contract, all the other projects were constructed by administration. With the exception of item 4 which is being undertaken by the Superintendent of the Sibalom-San Jose Irrigation System, the construction of all the others was supervised by district engineers.

Name	Province	Municipality	Estimated cost	Type of work	Remarks
1. Camut River Control	Albay	Oas	₱15,000	Channel improvement, earth and permeable dykes.	Partly damaged, under repair.
2. Pagsanhan River Control	do.	Pandan	8,000	Dyke and channel improvement	Completed; slightly damaged.
3. Bacong River Control	Antique	Culasi	50,000	Permeable dyke and channel improvement	Partly completed. Appropriation ₱30,000.
4. Tipuluan River Control	do.	Sibalom	80,000	Spur dykes and earth dyke	Under construction, appropriation—₱20,000.
5. Argao River Control	Cebu	Argao	9,000	Bamboo revetment and cut-off channel	Completed.
6. Magat River Control	Nueva Vizcaya	Bayombong	25,000	Bamboo revetment and permeable dyke	Extension and maintenance.
7. Pampanga River Control	Pampanga	San Simon, Arayat, San Luis and Apalit.	20,000	Earth dyke maintenance	Improvement and maintenance.
8. Agno River Control	Pangasinan	Urbiztondo	40,000	Earth dyke maintenance, surfacing and construction.	Under construction.
9. Bayambang Dyke	do.	Bayambang	160,000	Earth dyke and bank revetment	Do.

SEWERAGE SYSTEMS

The construction of the Vigan Sewerage System can be considered as completed at the end of the year, excepting the construction of the extra septic tank units. The system, however, is already in operation. This project was financed from the proceeds of a bond issue by the Municipality of Vigan and is estimated to cost ₱110,000. The construction of the Lucena Storm Drain System was reported 97 per cent complete at the end of the year, only a few minor details



O'DONNELL RIVER IRRIGATION SYSTEM HEADWORKS, TARLAC PROVINCE

lacking for final completion. This system is also under operation and is estimated to cost ₱150,000. Construction work has been started on the Zamboanga Sewerage System, which is estimated to cost ₱130,000.

Preliminary designs and estimates of cost have been prepared for the following projects:

1. Batangas Sewerage System, Batangas	₱95,000.00
2. Cavite Sewerage System, Cavite........	95,000.00
3. Cavite Storm Drain System, Cavite....	80,000.00
4. Cebu Sewerage System, Cebu............	440,000.00
5. Davao Sewerage System, Davao..........	130,000.00
6. Cabanatuan Sewerage System	130,000.00
7. Lucena Sewerage System, Tayabas....	120,000.00
Total	1,090,000.00

WATERWORKS

The Division prepared plans and specifications for 27 provincial and municipal waterworks projects on which construction work was started during 1930. These projects will furnish potable water to a population of 90,700 at an estimated cost of ₱1,585,500. Preliminary designs and estimates of cost were also made for 53 provincial and municipal waterworks projects, most of which are to be financed from loans. These projects were designed to supply 135,060 people at an estimated cost of ₱1,908,300.

Construction work was completed by district engineers on 29 waterworks projects including one extension and two improvements, started during previous years, leaving 76 projects under construction at the end of the year. The completed projects cost ₱889,733.05 and serve a total population of 63,680 while the 76 projects still under way are estimated to cost ₱6,814,700 and will provide a potable water supply for 379,630 people. The pipe and other materials required for the 27 waterworks projects on which construction was started were imported from the United States during the early part of the year.

There were 136 waterworks projects under consideration which contemplate furnishing water to a total population of 422,560 and are estimated to cost approximately ₱7,001,200. As soon as the municipalities concerned are able to finance these projects, construction work will be undertaken, excepting a few projects which require further investigations.

There have been completed thus far 222 municipal and provincial water supply systems, 8 extensions and 3 improvements in the Philippine Islands excluding the Manila Metropolitan Water System, which furnish potable water to a total population of 705,057 and have cost ₱8,184,720.93.

The status of all waterworks projects to date is shown in the accompanying lists as follows

Table A—Waterworks projects under construction.
Table B—Waterworks projects completed.
Table C—Waterworks projects under consideration.

TABLE A.—WATERWORKS PROJECTS UNDER CONSTRUCTION

Province	Municipality	Type of system	Population to be served	Estimated cost	Funds available	
					Insular allotment	Municipal allotment
Albay	Bacacay	Gravity	3,000	₱39,000	₱22,000	₱15,000.00
Do.	Tiwi [a]	do.	3,000	42,000	8,000	15,000.00
Antique	Dao [a]	do.	1,100	18,000	5,000	6,000.00
Do.	Pandan	do.	1,500	24,000	14,000	10,042.00
Bataan	Balanga [a]	Pumping	5,500	69,000	25,000	23,000.00
Batanes	Itbayat	Gravity	1,000	15,000	6,000	3,155.68
Batangas	Bolbok	Pumping	3,000	75,000	15,000	26,410.83
Do.	Lipa Improvement [a]	Gravity		46,000	21,000	25,000.00
Bohol	Anda Extension [a]	do.	3,000	20,000		5,099.62
Do.	Clarin [a]	Gravity	3,000	24,000	15,500	8,000.00
Do.	Cortes [a]	Pumping	1,500	34,000	20,000	11,975.00
Do.	Dimiao	Gravity	2,000	37,000	20,000	12,286.97
Do.	Loay Extension	do.		11,000	6,000	6,181.71
Do.	Loon	do.	5,000	33,000	22,000	11,000.00
Do.	Maribojoc [a]	do.	3,500	45,000	25,000	14,987.73
Do.	Valencia	do.	2,000	24,000	12,000	12,185.69
Bulacan	Bulacan	Pumping	5,000	80,000	50,000	25,000.00
Do.	Hagonoy	do.	8,000	80,000	45,000	33,400.00
Do.	Marilao	do.	1,200	6,000	4,000	2,000.00
Do.	Meycauayan	do.	6,000	70,000	45,000	25,000.00
Do.	San Miguel	do.	7,000	75,000	50,000	25,000.00
Do.	Santa Maria [a]	do.	3,000	48,000	20,000	16,000.00
Camarines Sur	Camarines Sur Metropolitan Waterworks	Gravity	14,000	330,000	91,500	213,813.18
Capiz	Capiz–Ivisan	do.	8,000	186,000	97,000	58,000.00
Cavite	Dasmariñas	do.	5,000	31,000	14,000	7,156.50
Cebu	Badian [a]	do.	1,700	30,000		16,195.16
Do.	Cebu Extension to Lahug and Pardo	do.	4,500	89,000		50,000.06
Do.	Moalboal Extension	do.	3,000	25,000		8,400.00
Davao	Davao Metropolitan Waterworks [a]	do.	7,000	370,000	15,000	205,000.00
Iloilo	Iloilo Metropolitan Waterworks	do.	91,500	2,100,000	359,700	1,585,438.56
Do.	Pototan–Dingle	do.	9,200	209,000	40,000	168,559.78
Do.	Sara	do.	2,000	42,000	30,000	15,000.00
Ilocos Norte	Ilocos Norte Metropolitan Waterworks	do.	34,300	750,000	164,000	425,794.90
Ilocos Sur	Narvacan [a]	do.	3,000	71,000		25,000.00
Do.	Santiago	do.	1,800	18,000	12,000	6,000.00
Laguna	Calauan [a]	do.	2,600	45,000		12,000.00
Lanao	Dansalan [a]	Pumping	1,300	22,000		5,000.00
La Union	Agoo [a]	Gravity	1,500	24,000	12,000	12,000.00
Do.	Naguilian [a]	do.	2,500	39,000	7,000	17,000.00
Leyte	Maasin [a]	do.	3,300	21,000		7,000.00
Masbate	Aroroy	do.	1,000	8,000	5,000	3,000.00
Do.	Masbate	do.	4,000	56,000	20,000	36,000.00
Do.	San Fernando	do.	2,500	20,000	13,300	6,666.66
Mountain Province	Lubuagan	do.	1,200	8,000	5,000	
Oriental Misamis	Cagayan Improvement	do.	5,000	38,000		34,339.25
Occidental Negros	Bacolod	do.	8,000	202,000	110,000	112,441.24
Do.	Silay	Pumping	5,000	75,000	50,000	25,000.00
Oriental Negros	Bais [a]	Gravity	3,000	36,000	20,000	17,546.96
Do.	Tayasan [a]	do.	2,500	22,500	15,000	7,500.00
Do.	Zamboanguita [a]	do.	3,000	40,000	10,000	12,426.55
Palawan	Bacuit	do.	1,000	3,200	2,500	700.00
Do.	Balabac Extension	do.	800	5,000	3,200	
Do.	Barrio Bintuan	do.	1,000	5,500	3,700	1,000.00
Do.	Culion	Gravity and pumping	5,000	45,000	39,000	
Do.	Cuyo	Pumping	800	10,000	6,650	3,000.00
Do.	Oton	Gravity	330	5,000	3,000	
Do.	Puerto Princesa Improvement	Pumping	400	4,500	3,000	1,500.00
Pampanga	Guagua	do.	6,000	70,000	39,000	22,543.35
Pangasinan	Dagupan [a]	do.	4,000	78,000	20,000	80,000.00
Do.	Rosales [a]	do.	3,000	63,000		25,000.00
Rizal	Antipolo Improvement	do.	4,000	25,000	25,000	
Samar	Wright	Gravity	3,000	45,000	25,000	15,000.00
Sorsogon	Bulan [a]	do.	9,000	105,000	20,000	35,000.00
Do.	Casiguran–Juban [a]	do.	10,000	114,000	40,000	39,000.00
Do.	Castilla	do.	1,500	80,000	17,000	11,500.00
Sulu	Jolo Improvement	do.	8,600	33,000	20,000	16,151.00
Tayabas	Atimonan	do.	6,000	102,000	59,000	50,000.00
Do.	Baler [a]	do.	2,500	55,000	25,000	12,500.00
Do.	Barrio Bondo, Mulanay	do.	300	6,000	2,000	4,000.00
Do.	Barrio Hingoso, Macalelon	Rain tank		5,000		2,000.00
Do.	Calauag [a]	Gravity	6,000	84,000	20,000	20,000.00
Do.	Casiguran	Rain tank		5,000		4,000.00
Do.	Dolores	Gravity	1,000	15,000	9,000	5,000.00
Do.	Laguimanoc	Rain tank		5,000		8,200.00
Do.	Tayabas Extension [a]	Gravity	1,200	20,000		13,812.14
Zambales	San Antonio	do.	4,000	54,000	3,674.33	(b)
Total			379,630	6,814,700	1,583,724.33	3,739,010.41

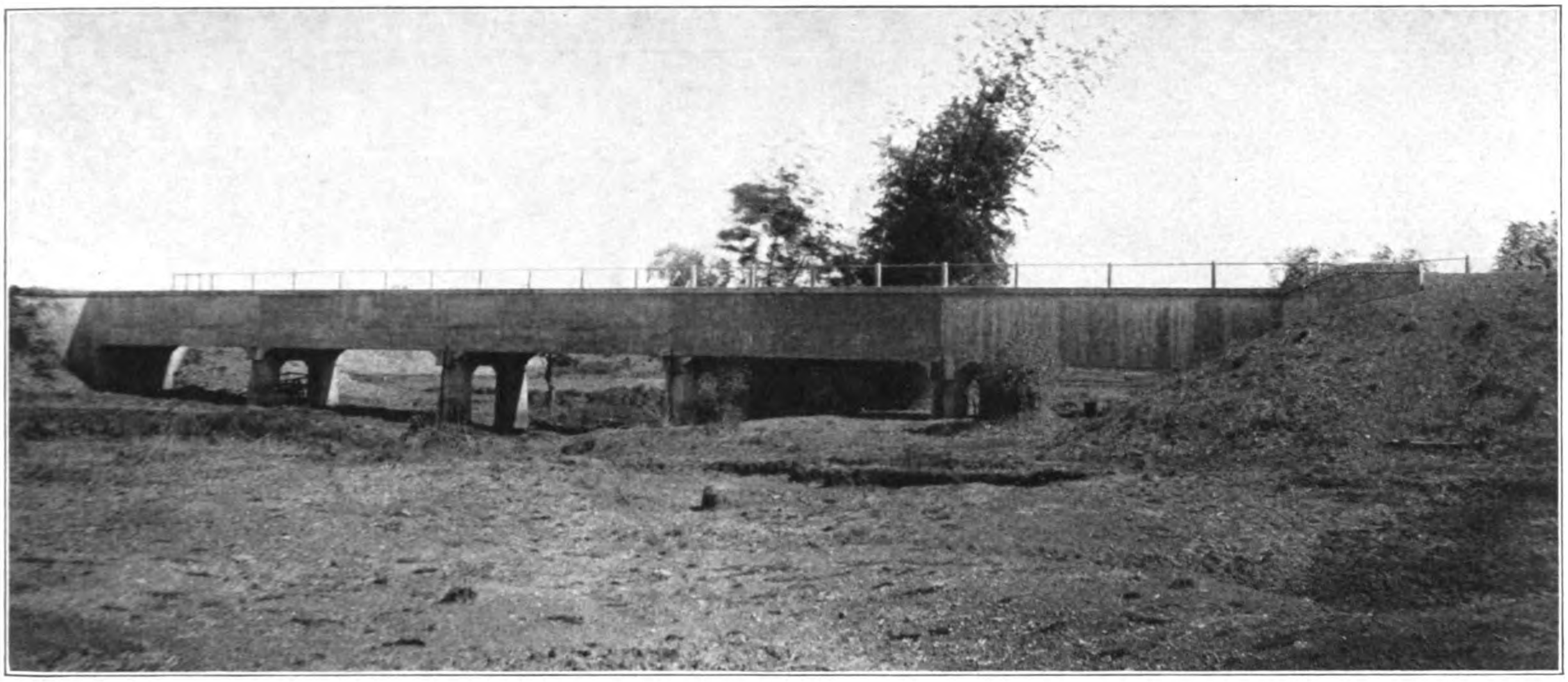
[a] Projects for which design and estimate were made during 1930.

(b) One-third cost guaranteed by Municipal Council and Provincial Board.

TABLE B.—WATERWORKS PROJECTS COMPLETED

Province	Municipality	Cost	Population served	System	Capacity of system gallons per day
Abra	Bangued	₱130,755.85	6,600	Gravity	180,000
Do.	Bangued Improvement.	16,148.28			
Albay	United States Reservation, Regan Barracks and Legaspi.	60,000.00	5,000	Pumping	259,200
Do.	Camalig	12,450.38	2,500	Gravity	100,000
Albay	Daraga–Legaspi.	₱171,628.63	20,000	Gravity	470,000
Do.	Jovellar	13,735.49	2,500	do.	122,000
Do.	Guinobatan	49,853.81	5,000	do.	288,000
Do.	Ligao–Oas [a]	157,532.41	12,000	do.	430,000
Do.	Barrio San Miguel, Tabaco.	2,049.51	400	do.	5,760
Do.	Tabaco [a]	52,740.90	5,500	do.	216,000
Antique	Barbaza [a]	15,829.59	1,500	do.	86,400
Do.	Bugason	18,306.56	2,500	do.	44,000

[a] Projects completed in 1930.



FLUME, PEÑARANDA IRRIGATION SYSTEM, NUEVA ECIJA PROVINCE

TABLE B.—WATERWORKS PROJECTS COMPLETED—Continued

Province	Municipality	Cost	Population served	System	Capacity of system gallons per day
Antique	Culasi	₱30,272.95	1,700	Gravity	100,000
Do	Patnoñgon [a]	11,165.28	1,000	do.	18,720
Do	San Jose	41,846.74	4,000	Pumping	47,520
Do	Sibalom	21,837.08	2,500	Gravity	50,400
Bataan	Sisiman	12,138.04	(Cattle)	do.	37,000
Batangas	Balayan	7,353.92	2,000	do.	100,000
Do	Batangas	71,529.96	6,147	Pumping	144,000
Do	Bauan	41,985.96	4,700	do.	93,600
Do	Cuenca	5,000.00	2,500	Gravity	5,040
Do	Lemery	47,132.84	7,200	Pumping	200,000
Do	Lian	4,507.27	3,000	Gravity	57,600
Do	Lipa	103,065.87	5,000	Pumping	172,800
Do	Rosario	20,232.67	5,000	do.	223,200
Do	San Jose	44,089.45	4,000	Gravity	216,000
Do	Santo Tomas	27,108.65	1,910	do.	50,400
Do	Taal	91,188.34	5,000	Pumping	187,200
Do	Taal Extension	57,220.41	4,000	do.	80,000
Do	Talisay	15,552.81	2,130	Gravity	64,800
Do	Tanauan	55,615.02	2,500	do.	45,000
Bohol	Anda	16,429.84	2,500	do.	100,800
Do	Baclayon	25,660.72	1,500	do.	18,400
Do	Calape	26,521.41	2,600	do.	156,000
Do	Dauis	5,100.00	840	do.	77,760
Do	Duero	10,823.56	2,000	do.	86,400
Do	Guindulman	15,507.56	2,000	do.	70,560
Do	Inabanga	45,362.63	4,000	do.	160,000
Do	Jagna	24,115.26	3,000	do.	43,200
Do	Loay	18,968.72	3,000	do.	144,000
Do	Loboc	20,069.91	3,000	do.	61,900
Do	Mabini	6,750.00	1,300	do.	72,000
Do	Tagbilaran	13,837.47	5,245	Pumping	77,760
Do	Tubigon	37,094.06	4,800	do.	100,800
Bukidnon	Deliric	(No data)	600	Gravity	4,320
Do	Malaybalay	11,641.16	1,300	do.	20,160
Do	San Luis	650.00	500	do.	
Bulacan	Hagonoy	7,564.87	2,789	do.	50,400
Do	Malolos	131,179.20	6,000	Pumping	360,000
Do	Marilao	22,101.50	Bath House.	Gravity	
Do	Sibul, San Miguel.	256,000.00	Bath House.	do.	
Cagayan	Tuguegarao [a]	188,665.13	10,000	do.	201,600
Camarines Norte	Mambulao	1,200.00	1,823	do.	
Do	Paracale	8,544.03	2,500	do.	100,800
Camarines Sur	Pasacao [a]	4,639.29	1,000	do.	43,200
Capiz	Capiz	13,541.92	5,400	Rain tank	264,170
Cavite	Cavite	111,691.58	10,900	Pumping	200,000
Do	Indang	39,627.40	3,000	do.	144,000
Do	Mendez-Nuñez	60,700.00	1,600	do.	57,600
Do	Silang	36,154.89	4,000	Gravity	100,000
Cebu	Alegria	11,431.86	1,000	do.	43,200
Do	Balamban	25,009.14	4,800	do.	72,000
Do	Barili	26,958.28	2,067	do.	61,200
Do	Carcar	64,004.45	4,463	do.	216,000
Cebu	Carcar Improvement [a].	₱30,000.00		Gravity	
Do	Catmon	16,399.56	1,624	do.	38,000
Do	Cebu	526,000.00	65,000	do.	806,400
Do	Cebu-Labangon	16,000.00			576,000
Do	Cebu-Sambag	35,789.18			187,200
Do	Cordova	4,810.74	1,191	Rain tank	30,000
Do	Daanbantayan	5,672.99	579	do.	30,000
Do	Dalaguete	14,941.15	3,500	Pumping	36,000
Do	Dalaguete Extension.	27,372.84		Gravity	57,600
Do	Barrio Malones, etc. Dalaguete [a].	12,000.00	1,600	do.	53,000
Do	Danao	42,055.89	2,500	do.	57,600
Do	Dumanjug	35,638.29	1,500	Pumping	187,200
Do	Ginatilan	13,404.80	2,669	Gravity	43,200
Do	Mainit	2,000.00		do.	
Do	Malabuyoc	14,941.15	1,500	do.	104,540
Do	Minglanilla [a]	12,542.77	1,500	do.	36,000
Do	Moalboal	14,297.27	2,108	do.	54,720
Do	Naga	6,800.00	3,233	do.	79,200
Do	Naga Extension	4,552.48		do.	
Do	Opon	36,568.44	1,500	Pumping	144,000
Do	Pilar	5,019.21	702	Gravity	14,400
Do	Barrios Dapdap, Lanao, Pilar [a].	9,882.70	1,000	do.	46,080
Do	Poro	8,873.63	1,000	do.	21,600
Do	Barrio Esperanza, Poro.[a]	7,200.00	500	do.	25,920
Do	Samboan	7,514.11	2,741	do.	49,250
Do	San Isidro	1,388.13	650	do.	34,560
Do	San Fernando	20,273.17	3,000	do.	108,000
Do	San Francisco	6,200.00	1,243	do.	10,000
Do	Sibonga	35,300.00	2,661	do.	63,360
Do	Sogod	13,221.44	2,200	do.	94,000
Do	Tuburan	55,335.55	3,900	do.	120,960
Do	Tudela	8,263.29	851	do.	24,480
Do	Barrio Villahermosa, Tudela.[a]	6,000.00	500	do.	24,480
Cotabato	Parang	9,600.00	600	Pumping	21,600
Davao	Davao	137,195.14	6,000	Gravity	86,400
Ilocos Norte	Badoc	33,560.74	2,800	Pumping	108,000
Ilocos Sur	Caoayan [a]	15,531.33	1,700	Gravity	57,600
Do	Santa	19,930.19	875	do	35,000
Do	Bantay	6,929.10	2,500	do.	201,600
Do	Santa Catalina	18,473.58	1,500	do.	
Do	San Vicente	22,606.50	2,000	do.	
Do	Vigan	127,399.52	8,440	do.	
Iloilo	San Dionisio	11,488.82	1,500	do.	46,500
Isabela	Ilagan	(No record)		Rain tank	40,000
Laguna	Alaminos	28,496.85	1,130	Gravity	95,000
Do	Bay	2,767.72	1,471	do.	86,400
Do	Calamba	75,275.88	7,000	Pumping	288,000

[a] Projects completed in 1930.

TABLE B.—WATERWORKS PROJECTS COMPLETED—Continued

Province	Municipality	Cost	Population served	System	Capacity of system gallons per day
Laguna	Lilio	₱35,528.77	4,500	Gravity	316,800
Do	Los Baños	18,585.04	6,000	do.	288,000
Do	Luisiana	50,708.07	4,500	do.	216,000
Do	Lumban	19,731.79	4,300	do.	107,000
Do	Magdalena	68,549.54	3,000	do.	40,000
Do	Majayjay	38,686.06	3,200	do.	187,200
Do	Nagcarlang	36,034.42	2,500	do	180,000
Do	Paete	10,428.77	4,500	do.	216,000
Do	Pagsanjan	73,782.67	4,044	Pumping	233,280
Do	Rizal	26,777.56	3,000	Gravity	216,000
Do	San Pablo	89,455.82	7,000	do.	576,000
Do	Santa Cruz	92,892.43	6,000	Pumping	352,800
La Union	Rosario [a]	9,917.21	1,050	Gravity	43,200
Do	San Fernando	92,732.94	5,000	do.	300,000
Leyte	Baybay	72,899.23	8,000	do.	136,800
Do	Baybay Agricultural School.[a]	7,954.31	500	do.	72,000
Do	Liloan	7,483.63	700	do.	28,800
Do	Merida [a]	9,740.73	1,000	do.	28,800
Do	Maripipi [a]	3,277.65	1,000	do.	16,400
Do	Villaba [a]	8,531.39	1,700	do.	36,000
Marinduque	Boac	6,653.00	1,000	Pumping	57,600
Do	Gasan	22,124.97	1,400	do.	144,000
Do	Malbog	13,614.29	1,000	Gravity	61,920
Do	Mogpog	10,535.69	1,280	do.	18,288
Do	Santa Cruz	20,696.23	2,560	do.	158,400
Do	Torrijos	23,881.93	5,000	do.	129,600
Mindoro	Abra de Ilog	4,743.74	350	do.	14,400
Do	Bulalacao	3,232.08	700	do.	43,200
Do	Calapan	29,743.47	2,500	Pumping	57,600
Mountain Province.	Baguio	229,605.89	6,000	Pumping and Gravity.	350,000
Do	Bontoc [a]	38,573.40	2,000	Gravity	86,400
Do	Cervantes	7,565.07	800	do.	
Do	Itogon	1,259.93	250	do.	10,080
Do	Mansion House	2,144.58	100	Pumping	40,000
Do	Teacher's Camp.	(No data)	1,500	do.	216,000
Do	Trinidad Farm School.	19,330.93	300	Gravity	36,000
Do	Trinidad Stock Farm.	2,000.00	60	do.	8,640
Nueva Ecija	Cabanatuan	111,302.49	6,000	Pumping	100,000
Do	Muñoz Agricultural School.	10,000.00	1,000	do.	86,400
Oriental Misamis.	Balingasag	8,924.14	1,514	Gravity	57,600
Do	Cagayan	50,408.82	3,000	Pumping	86,400
Do	Catarman	18,862.22	4,000	Gravity	144,000
Do	Mahinog	6,000.00	5,727	do.	
Do	Mambajao	30,000.00	14,446	do.	
Do	Sagay	800.00	6,321	do.	
Do	Salay	9,731.89	2,000	do.	43,200
Occidental Negros	Calatrava [a]	35,835.37	1,500	do.	201,600
Do	Barrio Toboso, Escalante.[a]	16,385.37	800	Gravity	36,000
Do	Murcia [a]	40,455.78	1,500	do.	144,000
Oriental Negros	Ayungon [a]	19,594.65	1,000	do.	57,600
Do	Bacong	27,210.48	1,800	do.	43,200
Do	Basac	(No data)	265	Pumping	
Do	Dauin	22,296.01	1,500	Gravity	37,600
Do	Dumaguete	84,131.43	4,000	Pumping	288,000
Do	Guihulngan	21,096.31	3,500	Gravity	144,000
Do	Larena	(No data)			
Do	Lazi	6,980.77	2,300	do.	
Do	Libertad	42,745.04	1,600	do.	50,400
Do	Luzuriaga	12,317.44	2,500	do	269,200
Do	Manjuyud [a]	11,826.29	2,000	do.	18,720
Do	Maria	1,360.05		do.	
Do	Maria Extension	2,677.41	1,000	do.	7,400
Do	Siquijor	18,000.00	1,577	do.	
Do	Siquijor Extension.	(No data)	494	do.	
Do	Talingting	5,025.00	2,890	do.	6,480
Do	Tanjay	40,664.64	3,000	do.	34,560
Do	Vallehermoso	17,390.14	2,500	do.	115,200
Palawan	Coron	7,844.63	1,150	Pumping	20,160
Do	Puerto Princesa	10,268.45	716	do.	28,800
Pampanga	Angeles	12,318.52	5,708	do.	61,920
Do	Arayat	35,180.95	3,840	Gravity	144,000
Do	San Fernando	1,050.02	1,000	Pumping	86,400
Do	San Fernando [a]	72,217.03	5,000	do.	216,000
Pangasinan	Alcala	3,000.00	2,200	Gravity	129,600
Do	Bani	12,411.86	2,000	do	86,400
Do	Bayambang	8,652.80	2,400	do.	108,000
Do	Dagupan	2,823.02	Market	do.	
Do	Lingayen	3,938.99	do.	do.	
Do	do.	9,141.22	School	do.	
Do	do.	96,682.22	7,000	Pumping	288,000
Do	Mangaldan	635.53	Market.	Gravity	122,400
Do	San Fabian	682.87	do.	do.	57,600
Do	San Manuel	38,267.76	4,000	do.	172,800
Rizal	Antipolo	23,299.07	2,250	Pumping	82,080
Do	Pasig	40,000.00	10,000	do.	86,400
Do	Insular Asylum, San Felipe Neri.	13,881.86	1,200	do.	120,000
Romblon	Badajoz [a]	21,743.39	1,500	Gravity	146,880
Do	Cajidiocan	5,382.59	1,000	Pumping	8,640
Do	Looc	27,760.12	2,000	Gravity	144,000
Do	Odioñgan [a]	37,695.95	3,000	do.	76,000
Romblon	Romblon	(no data)	2,300	Gravity	
Samar	Calbayog	do.	Market	do.	20,000
Do	Catbalogan	₱64,308.94	2,000	do.	35,000
Do	Oras	(No data)	4,000	do.	
Sorsogon	Bacon	21,000.00	3,200	do.	79,200
Do	Gubat	76,998.62	7,000	do.	288,000
Do	Magallanes	8,000.00	3,500	Pumping	
Do	Sorsogon	70,701.49	6,000	Gravity	206,000
Do	do.	1,044.67	250	Pumping	36,000
Sulu	Jolo	76,974.29	5,000	do.	115,200
Surigao	Barrio Bacuag, Gigaquit.	7,500.00	2,405	Gravity	
Do	Lianga	1,924.58	1,290	do.	2,880
Do	Placer	13,133.95	870	do.	18,720
Tarlac	Moncada	22,122.26	3,000	do.	86,400
Tayabas	Agdangan	2,187.55		Rain tank	20,000
Do	Barrio Sangirin, Alabat.	2,070.55		do.	20,000
Do	Candelaria	60,646.04	3,500	Gravity	216,000
Do	Calauag	4,931.75		Rain tank	40,000
Do	Guinayangan	16,073.26	1,500	Gravity	86,400
Do	Gumaca	4,482.17	1,600	Rain tank	40,000
Do	Infanta	4,424.55	1,200	do.	40,000
Do	Lucban	50,205.60	3,200	Gravity	316,800
Do	Lucena	234,390.57	7,500	do.	
Do	Lucena Improvement.	36,600.74	2,500	do	530,000
Do	Mauban	57,209.32	3,500	Pumping	144,000
Do	Mulanay	17,369.53	1,300	Gravity	180,000
Do	Pagbilao	70,538.47	2,300	do.	
Do	Pagbilao Improvement.[a]	22,000.00	1,330	do.	115,000
Do	Pitogo	4,857.57		Rain tank	40,000
Do	Polillo [a]	10,264.13	1,000	Gravity	39,000
Do	Quezon	2,989.62		Rain tank	20,000
Do	Sampaloc	22,957.61	3,000	Gravity	129,600
Do	San Narciso	14,297.61	1,000	do	43,200
Do	Sariaya	37,935.00	6,000	do.	201,600
Do	Tayabas	125,159.36	4,600	do.	173,000
Do	Tiaong	49,694.74	1,880	do	167,200
Do	Unisan	4,490.89		Rain tank	40,000
Zambales	Subic	10,670.62	1,628	Gravity	11,520
Zamboanga	Zamboanga	305,561.30	5,000	do.	504,000
Total		3,184,720.93	705,057		24,632,408

[a] Projects completed in 1930.

[a] Projects completed in 1930.

TABLE C.—WATERWORKS PROJECTS UNDER CONSTRUCTION

Provinces	Municipality	Estimated cost	Population to be served	System
Abra	Bucay [a]	₱24,000	700	Gravity.
Do.	Peñarubia	4,000	800	Do.
Albay	Calolbon	36,000	5,000	Do.
Do.	Libog	28,000	3,000	Do.
Do.	Libon	244,000	3,000	Do.
Do.	Polangui		8,000	Do.
Do.	Malilipot	33,000	3,000	Do.
Antique	Patnoñgon Extension [a]	1,500	500	Do.
Do.	San Jose Extension	40,000	1,500	Pumping.
Do.	Tibiao	25,000	2,000	Gravity.
Batanes	Ivana	50,000	2,000	Do.
Do.	Uyugan		1,500	Do.
Batangas	Batangas	340,000	7,000	Do.
Do.	Bauan		4,000	Do.
Do.	Ibaan		3,500	Do.
Do.	Lobo	12,000	1,000	Do.
Do.	Rosario Extension	22,000	1,000	Pumping.
Do.	Tuy [a]	60,000	1,500	Do.
Bohol	Alburquerque	15,000	1,500	Gravity.
Do.	Calape Extension	35,000	700	Do.
Do.	Carmen	6,100	600	Do.
Do.	Correlia	6,000	1,000	Do.
Do.	Garcia—Hernandez	31,600	2,000	Do.
Do.	Inabanga Extension	19,000	1,000	Do.
Do.	Lila	6,000	700	Do.
Do.	Loon Extension [a]	48,000	4,800	Do.
Bukidnon	Ampasugong	36,000	1,600	Do.
Bulacan	Baliuag	120,000	8,000	Pumping.
Do.	Obando	75,000	5,000	Do.
Do.	Pulilan	18,000	3,000	Gravity.
Do.	San Ildefonso	45,000	2,500	Pumping.
Cagayan	Aparri	346,000	9,200	Do.
Do.	Camalaniugan		2,350	Do.
Do.	Lallo		1,400	Do.
Do.	Tuguegarao Extension [a]	12,000	1,000	Gravity.
Camarines Sur	Camarines Sur Metropolitan Extension.[a]	21,000	1,850	Do.
Do.	Iriga	70,000	10,000	Pumping.
Do.	Lagonoy	42,000	4,000	Gravity.
Do.	Camarines Sur Agricultural School, Pili.	15,000	300	Do.

[a] Projects for which design and estimate were made during 1930.

TABLE C.—WATERWORKS PROJECTS UNDER CONSTRUCTION—Continued

Province	Municipality	Estimated cost	Population to be served	System
Capiz	Buruanga [a]	₱9,600	2,200	Gravity.
Do.	Capiz Metropolitan	480,000	15,000	Do.
Do.	Dumalag	60,000	5,000	Do.
Cavite	Imus [a]	63,000	3,000	Pumping.
Cebu	Alegria Extension	13,000	1,500	Gravity.
Do.	Asturias	27,000	1,100	Pumping.
Do.	Argao	39,000	4,500	Gravity.
Do	Bantayan	50,000	4,000	Pumping.
Do.	Barili Extension	8,600	300	Gravity.
Do.	Cebu Extension to Consolacion.[a]	12,000	1,200	Pumping.
Do.	Cebu Extension to Mandaue.[a]	16,500	2,500	Do.
Do.	Cebu Extension to Mandaue.	35,000	2,500	Gravity.
Do.	Dumanjug Improvement	32,000	3,200	Do.
Do.	Oslob	15,000	2,000	Do.
Do.	Dapdap–Lanao Extension, Pilar.[a]	7,500	300	Do.
Do.	Ronda	30,000	1,900	Do.
Do.	San Francisco Improvement.	27,000	2,000	Do.
Do.	Talisay	30,000	2,000	Do.
Cotabato	Cotabato	62,000	1,250	Pumping.
Do.	do.	150,000	4,000	Gravity.
Davao	Santa Cruz [a]	39,000	1,500	Do.
Ilocos Norte	San Nicolas [a]	65,000	10,000	Do.
Ilocos Sur	Cabugao [a]	71,000	4,000	Do.
Do.	Caoayan Extension [a]	2,500	700	Do.
Do.	Magsingal	63,000	4,000	Do.
Do.	Narvacan [a]	71,000	3,000	Do.
Do.	San Esteban	9,000	1,500	Do.
Do.	Santo Domingo [a]	90,000	2,500	Do.
Do.	Sinait [a]	65,000	4,000	Do.
Iloilo	Ajuy	8,000	1,100	Do.
Do.	Passi [a]	33,000	2,000	Do.
Isabela	Ilagan	126,000	5,500	Do.
Laguna	Bay [a]	48,000	4,500	Do.
Do.	Calamba Extension [a]	11,000	1,000	Do.
Do	Lilio Extension	27,500	2,500	Do.
Do.	Los Baños Extension [a]	30,000	4,100	Do.
Do.	Pañgil [a]	24,000	1,800	Do.
Do.	Pila	42,000	2,000	Pumping.
Do.	Rizal Extension [a]	5,000	250	Gravity.
Do.	Santa Maria–Mabitac [a]	63,000	3,000	Do.
Lanao	Iligan	42,000	4,000	Do.
La Union	Bauang	61,000	2,500	Do.
Do.	San Fernando Extension	3,600	....	Do.
Leyte	Barrio San Ricardo, Pintuyan.	2,500	800	Do.
Do.	Calubian	4,000	800	Do.
Do.	Leyte Metropolitan	680,000	23,500	Do.
Do.	Merida Extension [a]	2,500	150	Do.
Do.	Pintuyan [a]	9,000	1,000	Do.
Do.	Sogod	12,300	2,000	Do.
Marinduque	Boac Capitol Building	6,500	500	Pumping.
Do.	Boac Improvement [a]	57,000	6,000	Do.
Do.	Barrio Balanacan, Mogpog.[a]	6,600	1,000	Gravity.
Mindoro	Pinamalayan [a]	₱39,000	2,000	Gravity.
Do.	Pola	21,500	2,000	Do.
Nueva Ecija	Gapan [a]	90,000	11,000	Pumping.
Do.	San Jose	60,000	5,000	Do.
Occidental Misamis	Jimenez	39,000	4,000	Gravity.
Do.	Misamis	66,000	3,450	Pumping.
Oriental Misamis	Barrio Jasaan, Balingasag.	20,000	2,500	Gravity.
Do.	Cagayan Extension [a]	16,500	3,000	Do.
Do.	Catarman Extension [a]	8,000	400	Do.
Do.	Gingoog [a]	39,000	3,000	Do.
Do.	Quinoguitan [a]	33,000	3,000	Do.
Do.	Talisayan	27,000	2,800	Do.
Occidental Negros	Pinucutan	2,300	....	Do.
Do.	San Carlos [a]	96,000	5,500	Do.
Do.	Talisay [a]	150,000	6,000	Do.
Oriental Negros	Ayuñgon Extension [a]	4,000	960	Do.
Do.	Ayuquitan [a]	36,000	1,850	Do.
Do.	Barrio Bolos	9,000	1,100	Do.
Do.	Jimalalud	21,000	1,700	Do.
Do.	Luzuriaga Extension	8,500	650	Do.
Do.	Manjuyud Extension [a]	2,000	250	Do.
Do.	Barrios Payabon, Domolog, etc., Manjuyud.[a]	35,000	1,300	Do.
Do.	San Juan	21,000	2,000	Do.
Do.	Siaton [a]	90,000	1,600	Do.
Do.	Sibulan [a]	33,000	1,500	Do.
Do.	Talingting Extension [a]	5,500	600	Do.
Do.	Tayasan Extension [a]	8,500	1,000	Do.
Palawan	Concepcion	3,600	600	Do.
Do.	Coron Improvement	13,000	600	Do.
Pampanga	Angeles	80,000	8,000	Do.
Do.	Magalang	45,000	2,500	Do.
Pangasinan	Malasiqui	57,000	2,600	Pumping.
Do.	San Carlos	90,000	4,500	Do.
Do.	Urdaneta	1,800	....	Gravity.
Romblon	Romblon Improvement [a]	9,000	4,000	Do.
Samar	Basoy [a]	135,000	8,000	Do.
Do.	Calbayog–Oquendo	250,000	7,000	Do.
Do.	Llorente	14,000	2,500	Pumping.
Do.	Oras Improvement	10,000	3,500	Gravity.
Do.	Tarangnan [a]	6,000	850	Do.
Sorsogon	Barcelona	25,500	4,000	Do.
Do.	Irosin	27,000	4,200	Do.
Do.	Magallanes	48,000	5,000	Do.
Do.	Matnog	16,000	2,500	Do.
Do.	Prieto–Diaz	30,000	2,000	Do.
Surigao	Surigao	48,000	4,000	Do.
Tarlac	Tarlac	135,000	6,000	Pumping.
Tayabas	Catanauan	40,000	4,000	Gravity.
Do.	General Luna [a]	27,000	1,300	Do.
Do.	San Andres, San Narciso.[a]	7,500	500	Do.
Do.	Tiaong Extension [a]	3,600	200	Do.
Zamboanga	Isabela [a]	40,000	3,000	Do.
Total		6,814,700	379,630	....

[a] Projects for which design and estimate were made during 1930.

APPENDIX

ACTIVE PROJECTS, JANUARY 1, 1931

Provinces	Roads and trails			Bridges and culverts			Provincial capitols			Presidencias		Prisons			Schools		Markets and tiendas		Hospitals			Miscellaneous buildings			Water systems			Electric light plants			Artesian wells			Port works			Miscellaneous projects							Total
	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Reconstruction	Construction	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Construction	Maintenance	Reconstruction	Wireless stations	Surveys and investigations	Irrigation systems	River control	Provincial or mun. boundaries	Monuments	Telephone No. lines	
Abra	13	6		1											12	1						2			2		1	1															1	40
Agusan	3	2													1							2												1			1	1		1				12
Albay	17	4		1			1					1			5		4					2			3									2			1	3		3				47
Antique	4	2							1						3				1						4										1					1				17
Bataan	3	3		3					1						3										1													1	1		1			17
Batangas	12	7					1	2		1			1		16		1								2									1			1	1		1		2		49
Benguet	12	13		1						2					3		2		1			34	1		1			5										1				1		77
Bohol	8	3		1											4										4																			20
Bukidnon	4	3				1									1				2			3																2						16
	6	3	10				1			1					1		3	1	1				1		12						1	1												42
	10	13	1	2		1	1			2	1	1		1	24	1						6		4	3									4	2		1	7	1			2		88
	6	3	1	1						1					7	1	1					1																1						23
	5	3	2	1				1		2			1		9	2	3			1		2			1						1	21						1						56
	10	2		2						1					19		3		1						1										1			1						41
	14	5		4						3					10		2								3													1						42
	17	5	6	2			1			3					27				2			4	1		4									8	1		1	2		1				85
Cotabato	8	14		2								1										2			2										1			2		1		1		34
Davao	5	4		4			1		1	1					2			1	1		3	4			1									4	2		5	1				3		43
Ilocos Norte	10	3									1				3							1			1									1								1		21
Ilocos Sur	6	5	3	1			1				1				11		3				1	2			4							3		1				1						43
Iloilo	21	3	1	3					1	4					6		1					4			7									5	1			3		1				61
Isabela	5	3								2					11								2	1																	2	1		27
Laguna	7	5	3												1		1					1	1																					19
Lanao	8	3	3												1							7	2	4	1		1					2		2			1	1						36
La Union	5	5	15	2						1					6	1	3					2			3													1						44
Leyte	12	4		1											9										2									1	5		1	1						36
Manila																																												--
Marinduque	4	3													4		1																							1				13
Masbate	3	2		3											9										3							1							1					22
Mindoro	5	2	1					1		1					4																			1			1		1					17
Occidental Misamis	4	2	1												1		1					1						1										8		1				19
Oriental Misamis	3	4	2	1						1					2						1	5					1								2									22
Mountain Province	7	12							1	2	1			1							1	3		6	1																1	1	1	38
Nueva Ecija	18	8		4			1			3					5	1	3	1				6		2	2						1							3						58
Nueva Vizcaya	1	6		1						1					2																								1	2				14
Occidental Negros	17	3		3			2			1					14		3		1			2			5			1										1						53
Oriental Negros	10	5	1	1			1								4										3										2									27
Palawan	2	2									2				7	2						1		2												1	1							20
Pampanga	4	5	1												5		1		1						1													1		1				20
Pangasinan	7	6		5						1	1				5		6		1																			2		4				38
Rizal	10	2	2			1	1								6	3	3							2	1													2						33
Romblon	8	1					1			1					9										3													5		1				29
Samar	19	3		1			1								26		1						1		2		1	1							3		3	10						72
Sorsogon	4	2	2																				1		2													1		1				13
Sulu	8	4	2												2	2	2		1			3	2											1	2		3	1						33
Surigao	4	2																																			1	1						8
Tarlac	5	3		1											5		1																					7						22
Tayabas	13	3	3							3					4		1	1				1	1	1	12		1	3						3			1	2		1			1	55
Zambales	5	2		2											8																													17
Zamboanga	8	4	1	1								1					3		1			8													1		2	2						32
Total	400	212	61	55	---	3	14	4	5	38	7	4	2	2	317	14	53	4	14	1	6	109	13	22	97	---	5	11	---	---	3	28	--	35	24	1	24	78	5	21	4	12	3	1711

BUREAU OF PUBLIC WORKS

STAFF AND PERSONNEL

(Corrected to January 1, 1931)

A. D. WILLIAMS, *Director of Public Works*
MARCIAL KASILAG, *Chief Constructing Engineer*
J. C. COOKINGHAM, *Chief Designing Engineer*
NICANOR CORTES, *Chief Irrigation Engineer*
J. M. ARELLANO, *Acting Consulting Architect*
R. REINOSO, *Chief, Administrative Division*

CENTRAL OFFICE ORGANIZATION

DESIGNING DIVISION

A. T. Sylvester, Port Works Engineer.
L. L. Vincent, Supervising E. and M. E.
Juan Piedad, C. E.
Domingo Guanio, C. E.
Eliodoro Segui, C. E.
Ross Hagler, Principal Engineering Aid.
Manuel I. Felizardo, E. and M. E.
Alejandro J. Villanueva, Designing Engineer.
Anastasio Pasos, M. E.
Cosme J. Ventura, E. E.
Vicente Villanueva, Asst. E. E.
Pablo Ilagan, Asst. E. E.
Arsenio P. Luna, Asst. C. E.
Marcos Amponin, Asst. M. E.
Domingo de la Paz, Asst. C. E.
Eugenio P. Ylo, Asst. C. E.
Nicanor Ruelos, Asst. C. E.
Feliciano Palma, Structural Draftsman.
Elpidio Molina, Structural Draftsman.

DIVISION OF ARCHITECTURE

Cheri Mandelbaum, Architect.
Antonio Toledo, Architect.
Teodato P. Macabulos, Designing Engineer.
Juan O. Altiveros, Architect.
Aurelio N. Cobangbang, Civil Engineer.
Gregorio Alcantara, Civil Engineer.
Ephraim Gochangco, Asst. Civil Engineer.
Angel Pascual, Civil Engineer.
Antonio M. Paterno, Assistant Civil Engineer.
Nicolas R. Jimenez, Civil Engineer.
Jacinto S. Ponce, Assistant Civil Engineer.

CONSTRUCTING DIVISION

V. Fragante, Highway Engineer.
E. D. Smith, Division Engineer.
Luis Francisco, Technical Adviser, on duty Paris Exposition.
Fidel V. Larracas, Division Engineer.
Dalmacio Urtula, Division Engineer.
B. C. Guerrero, Chief Locating Engineer.
L. T. Clark, C. E., Constructing Engineer.
Jose Wright, C. E., Superintendent, Maintenance, Alteration and Repair.
Juan T. Villanueva, Asst. M. E.
Ramon Madrigal, Asst. C. E.
Hermenegildo Reyes, Asst. C. E.
Rodolfo Maslog, Asst. C. E., Special Duty.

IRRIGATION DIVISION

W. J. Lamon, Project Engineer.
H. O. Bauman, Project Engineer.
Hilario S. Clemente, Designing Engineer.
Gregorio de Leon, Designing Engineer.
Jacinto Gochoco, Chief Hydrographer.
Gonzalo Garcia, Project Engineer.
Graciano J. Militante, Project Engineer.
Faustino Salvador, Project Engineer.
Filemon M. Zablan, Actg. Superintendent, Aganan River and Santa Barbara Irrigation Systems.
Procopio F. Eleazar, Superintendent, San Miguel and O'Donnell River Irrigation Systems.
Ramon C. Caluya, Superintendent, Tagudin, and Amburayan River Irrigation Systems.
Manuel Gonzales, Civil Engineer.
Julian A. Buendia, Civil Engineer.

IRRIGATION DIVISION—Cont.

Crisostomo Almajose, Civil Engineer.
Vicente R. Cruz, Civil Engineer.
V. Fernandez Lavadia, Civil Engineer.
Arturo J. Pancho, Civil Engineer.
Filemon Rodriguez, Civil Engineer.
Agapito Alano, Civil Engineer.
Servando P. Suguitan, Assistant Civil Engineer.
Albert L. Morrow, Assistant Civil Engineer.
Eleuterio Macalalag, Assistant Civil Engineer.
Andres O. Hizon, Assistant Civil Engineer.
Antonio A. Villanueva, Assistant Civil Engineer.
Tomas T. Zita, Assistant Civil Engineer.
Jose C. Velasquez, Assistant Civil Engineer.
Wilfred Demers, Supervising Hydrographer.
Roberto P. Villatuya, Hydrographer.
Antonio Baldonado, District Hydrographer.
Francisco Aquino, Assistant Hydrographer.
Manuel V. Trani, Assistant Hydrographer.
Lorenzo Ylarde, Assistant Hydrographer.
Tranquilino Mendoza, Jr. Hydrographer.
Emilio Perez, Jr. Hydrographer.
Bonifacio Ramos, Jr. Hydrographer.
Mauro Yambao, Jr. Hydrographer.
Artemio Abaya, Chief Water Rights Inspector.
Mariano N. Leones, Supervising Surveyor.
Eliseo Panopio, Surveyor.
Vitaliano Villavicencio, Water Right Inspector.
Isidoro Villo, Water Right Inspector.
Francisco S. Villanueva, Water spector.
Pedro Valderrama, Water Right I

DISTRICT ORGANIZATION

E. J. Halsema, D. E., Baguio, Benguet.
Irineo M. Santos, C. E., Baguio, Benguet.
B. T. Saldaña, Asst. C. E., Baguio, Benguet.
E. D. Smith, Division Engineer, First Division, Manila.
Bernabe Gregorio, D. E., Abra.
Mariano Lacandola, Asst. C. E., Abra.
Fil de Peralta, Acting D. E., Bataan.
Manuel Feliciano, Asst. C. E., Bataan.
Vicente Orosa, Act. D. E., Bulacan.
Pedro C. Olympia, Asst. C. E., Bulacan.
Dominador M. Cruz, Asst. C. E. Bulacan.
Manuel Diaz, Acting D. E., Cagayan-Batanes.
Bartolome Puzon, C. E., Cagayan.
Severino D. Pineda, Asst. C. E., Cagayan.
Julian Yandoc, Asst. C. E., Cagayan.
Jose Cruz, Asst. C. E., Cagayan.
Leon Ines, D. E., Ilocos Norte.
Amando Mirasol, Asst. M. & Elec. E., Albay.
Isaias Fernando, D. E., Batangas.
Gregorio Matanguihan, Asst. C. E., Batangas.
Carlos Amoranto, Asst. C. E., Batangas.
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